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

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Contribution by Portugal

to the CSTD 2024-2025 priority theme on "Diversifying economies in a world of accelerated digitalization"

1 - What are the specific challenges your economy is facing to develop or adapt frontier technologies and AI?

Portugal has been facing several multifaced challenges that are limiting the possibility of fully harness the opportunities brought by AI and other frontier technologies, namely:

Limited Funding and Investment:

Portugal faces challenges in securing sufficient funding and investment for the development and adaptation of frontier technologies and AI.[1] High costs of hardware and software further deter AI adoption in some fields, such as communication design.

Skills Gap and Workforce Development:

There are significant skill gaps in Portugal's workforce regarding expertise in digital technologies, necessitating substantial investment in education and professional development to build the required competencies[2]. Only 19% of businesses find it easy to recruit staff with adequate digital skills, and internal training also poses challenges, with just 19% finding it easy to upskill their workforce.[3]

Infrastructure and Technological Ecosystem:

Despite improvements in digital infrastructure, there are still areas, especially in rural regions, where connectivity and access to advanced technologies are limited. The digital divide has a greater impact on vulnerable groups, that usually have a less accessibility to resilient, high-performance infrastructure. Additionally, regulatory frameworks often cannot keep up with the rapid evolution of these technologies, thus there is a need to galvanize policy adjustments to support innovation without stifling it. Economic disparities and the need for inclusive growth further complicate the adoption process.

Public Awareness and Cultural Resistance:

Public awareness and cultural resistance can impede the acceptance and integration of frontier technologies and AI. Empowering end-users through digital literacy, transparency and control over their data is essential, especially as AI impacts internet openness and content distribution. For instance, although cloud adoption among Portuguese businesses grew to 27% in 2023 up from 24% in 2022, only 26% claimed to have a good understanding of what this technology does, compared to 39% across Europe.

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[1] OECD Science, Technology and Innovation Outlook 2021 - https://www.oecd-ilibrary.org/science-and-technology/oecd-science-technology-and-innovation-outlook-2021_75f79015-en
OECD Science, Technology and Innovation Outlook 2023 - https://www.oecd-ilibrary.org/science-and-technology/oecd-science-technology-and-innovation-outlook-2023_0b55736e-en
[2] European Commission's Digital Economy and Society Index (DESI) 2022 – Portugal - https://digital-strategy.ec.europa.eu/en/policies/desi-portugal
[3] https://www.unlockingeuropesaipotential.com/portugal

Adoption Skewed Towards Larger Companies:

The adoption of AI and other technologies is currently skewed towards larger companies, with 45% of larger companies using AI compared to just 32% of micro-SMEs. This disparity highlights the need for targeted support for smaller enterprises.

International Cooperation:

Fostering effective international cooperation is essential to leverage global expertise and share best practices, ensuring that Portugal can overcome these challenges and achieve sustainable technological advancement.

2 - Can you provide successful examples of AI and other frontier technologies uptake in your country?

Portugal has been implementing several AI and emerging technologies solutions across various sectors.

The Economist Intelligence Unit (2023) considers that countries with a thriving tech sector, such as Portugal, are further ahead. In this context, it is interesting to examine the Eurostat (online data code: ISOC_EB_AI) data on AI use by enterprises of different sizes in Portugal and how these statistics compare with the overall European Union Member States average:

- In the microenterprises sector, the adoption of AI technologies is available for Portugal but not for most of the EU27 Member-States. 11.6% of firms reported using at least one AI technology. Specific areas of application include marketing or sales (5.0%), organization of business administration processes (3.7%), enterprise management (2.8%), Information and Communication Technology (ICT), security (2.2%), production processes (1.3%), human resources management or recruiting (1.0%) and logistics (0.9%).

- In the small and medium enterprises (SMEs), Portugal is distinctly ahead of the EU27 average in AI adoption. 17.3% of enterprises use, at least, one AI technology, which places Portugal in the second position among EU27 countries, far above the EU27 average of 7.9%. In the specific application of AI technologies, Portuguese SMEs lead in marketing or sales, with 6.7% adoption (first position, compared to EU27 average of 1.7%). The country is also well ahead in their use of AI for organization of business administration processes (5.9%, second position), management of enterprises (4.9%, second position), human resources management or recruiting (2.6%, second position), production processes (3.9%, third position), applying AI technologies to logistics (1.7%, third position) and ICT security (4.4%, fourth position), compared to the EU27 averages of 1.8%, 1.2%, 0.7%, 1.6%, 0.8%, 1.9% respectively.
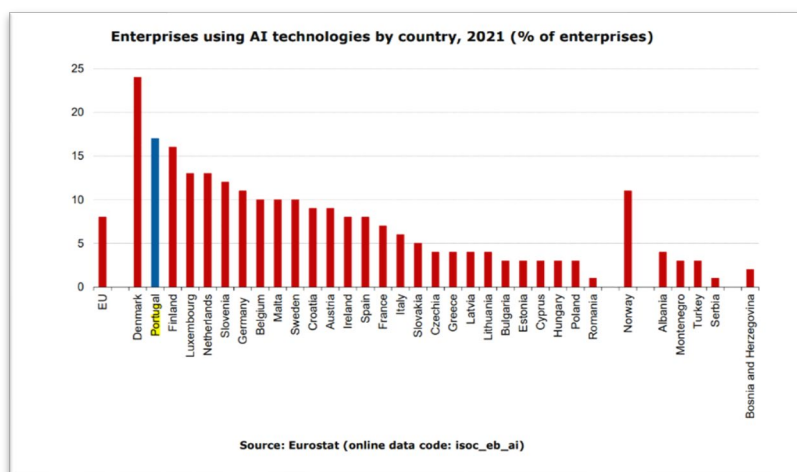
Figure 1 - Enterprises using AI technologies by country, 2021 (% of enterprises) - Eurostat.

Furthermore, it is worth mentioning the following successful examples of AI and other frontier technology uptake by Portugal:

Education:

Ciência Viva Clubs: Teaching young students the fundamentals of machine learning through Science Clubs, using real-world problems such has the challenges of biodiversity loss and pollution.

Creative/Collaborative Multimedia Content: Development of multimedia content in STEM subjects and Portuguese geography and history.

Programming Capabilities: Enhancing programming skills through expressive programming languages and platforms.

Higher Education Initiatives: Since 2000, numerous graduate and postgraduate degrees on data science and AI have been launched, alongside executive programs, advanced courses, and summer/winter schools on AI-related topics (e.g., big data, machine learning, business analytics, computer vision).

Healthcare:

SmartBEAT by Fraunhofer Portugal AICOS[4]: An AI-powered mobile telemonitoring solution for heart failure patients, monitoring clinical variables to manage conditions effectively.

SWORD Phoenix by SWORD Health[5]: An AI-powered digital therapist for home-based rehabilitation, using sensors to monitor patient movements and provide real-time feedback, reducing pain and improving mobility.

Public Transportation and Sustainable Mobility:

AI-Driven Metro Systems: Lisbon and Porto metro networks use AI solutions to optimize traffic flow and energy usage, reducing carbon emissions and improving efficiency.

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[4] https://www.aicos.fraunhofer.pt/en/home.html
[5] https://swordhealth.com/

Odivelas-Loures Overground Light Railway and Boavista-Imperio Bus Rapid Transit (BRT) System: Leveraging frontier technologies to enhance public transport accessibility and sustainability.

Veniam[6]: Provides vehicle-based networking technology for seamless connectivity and real-time data collection, supporting smart city initiatives.

Public Administration and Innovation:

AI4PA - Artificial Intelligence & Data Science for the Public Administration: Supports digital transition in public administration, increasing the effectiveness of public policies and quality of services.

GuIA - Guide for Artificial Intelligence: Launched in 2022 to help public entities develop AI-based solutions, focusing on accountability, transparency, explainability, fairness, and ethics. An online self-assessment tool for AI project risk was also developed.

Business Sector:

Microsoft AI Innovation Factory: Scheduled to open in November 2024, this initiative aims to accelerate the adoption of AI solutions across industries in partnership with Accenture, Avanade, and Unicorn Factory Lisbon.

Feedzai[7]: Uses AI to combat financial fraud, analysing vast amounts of transactional data in real-time to detect and prevent fraudulent activities. Feedzai's AI technology is used globally, making it a leading example of successful AI deployment from Portugal.

Community-Driven Initiatives:

Data Science Portugal (DSPT)[8]: Promotes AI and data science through workshops, hackathons, and collaborative projects, facilitating adoption in areas like environmental monitoring, urban planning, and public health.

UNINOVA's AIDEAS Project[9]: Focuses on developing AI technologies for the entire lifecycle of industrial equipment, aimed at improving sustainability and resilience in the manufacturing sector.

Data Availability and Transparency:

dados.gov.pt: Over 9000 datasets available, promoting transparency and efficiency within public services and providing a valuable tool for innovation and AI-based solutions.

3 - Has your country put in place inclusive policies for innovation and economic diversification specifically tailored diffusion of digital technologies and AI?

Yes, Portugal has implemented several inclusive policies aimed at fostering innovation and economic diversification, particularly through the diffusion of digital technologies and AI. Key initiatives and strategies, that are designed to ensure that all segments of the Portuguese population benefit from digital technologies and AI, promoting innovation, economic diversification, and social inclusion, include:

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[6] https://veniam.com/
[7] https://feedzai.com/
[8] https://www.facebook.com/datascienceportugal
[9] https://www.uninova.pt/

National Strategy for AI (AI Portugal 2030):

The National Strategy for Artificial Intelligence, AI Portugal 2030[10], is a cornerstone policy designed to elevate Portugal's standing in AI research, enhance workforce qualifications, and drive economic growth through AI technologies. Aligned with the European Coordinated Plan on Artificial Intelligence, this strategy focuses on seven pillars:

1. Promoting a better society.
2. Fostering AI skills and digital literacy for all.
3. Promoting new jobs and developing an AI-driven economy.
4. Positioning Portugal as a living lab for AI innovation.
5. Securing niche AI markets with specialized services.
6. Advancing AI research and innovation.
7. Enhancing public services and evidence-based policymaking with AI.

This strategy supports the development of AI applications that tackle societal challenges, promotes an AI innovation ecosystem, and ensures ethical and inclusive AI deployment.

INCODE 2030 Initiative:

The INCODE 2030 [11]initiative aims to enhance digital skills and promote digital inclusion across all societal segments. It encompasses five key areas: education and professional training, qualification and requalification, inclusion, advanced training, and research. Main actions include:

- Generalizing digital literacy for full citizenship and digital inclusion.
- Promoting gender equality to increase women's participation in the digital economy.
- Training students and teachers to foster inclusion and digital literacy.
- Enhancing employability through capacity-building in digital technologies.
- Strengthening digital skills in public administration to support the digital transition.
- Promoting digital-based entrepreneurship for high-growth, exportable products and services.
- Attracting investment for a tech-driven economic model and creating qualified employment.
- Ensuring equitable access to education, vocational training, and digital skills for persons with disabilities.

AI4PA Digital Innovation Hub (DIH):

Launched in 2023, the AI4PA Digital Innovation Hub aims to optimize public AI and Data Science applications by supporting the digital transformation of the public sector trough the development of innovative management services and solutions, and increasing the skills of public authorities and SMEs that provide services to them.

Recovery and Resilience Plan (PRR):

Portugal's Recovery and Resilience Plan[12], funded by the European Union, includes substantial investments to accelerate digital transformation and foster innovation. It supports various

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[10] https://www.incode2030.gov.pt/en/wp-content/uploads/2022/01/julho_incode_brochura.pdf

[11] Iniciativa Nacional Competências Digitais - INCoDe 2030 - Portugal Digital

[12] https://recuperarportugal.gov.pt/

initiatives aimed at enhancing digital infrastructure, promoting digital innovation in businesses, and boosting digital skills among citizens.

Digital Transition Action Plan:

Part of the PRR, the Digital Transition Action Plan [13]outlines initiatives to enhance digital infrastructure, support business digital innovation, and promote digital literacy. It includes investments in high-speed internet, digital literacy programs, and incentives for SMEs to adopt digital technologies.

Incentives for SMEs:

Portugal offers several incentives to help SMEs adopt digital technologies and innovate, including financial support for digital transformation projects, tax incentives for R&D activities, and access to innovation hubs and digital training programs.

Inclusive Education and Digital Skills:

Portugal has invested heavily in education and training programs to improve digital skills. The "National Digital Skills Initiative e.2030|INCoDe.2030"[14] focuses on enhancing digital literacy from early education through to professional training.

Research and Innovation Hubs:

Portugal has established numerous research and innovation hubs to foster collaboration between academia, industry, and government. These hubs[15] advance research in AI and other frontier technologies, promote innovation, and support startups and tech companies. Examples include the AI Centre of Competence at the Instituto Superior Técnico and the Fraunhofer Portugal Research Centre.

Startup Portugal:

Startup Portugal[16] is a public policy initiative supporting the startup ecosystem with funding, mentoring, and internationalization opportunities for tech startups.

4 - Do you have examples of policy instruments in place to favour the diffusion of frontier technologies in the economy and targeting specific sectors?

Yes, Portugal has implemented several policy instruments aimed at promoting the diffusion of frontier technologies across its economy, targeting specific sectors to foster innovation and competitiveness. Adding to the examples referred in previous questions (2 and 3):

Advanced Computing Portugal 2030 (ACP.2030):

Launched in 2019, ACP.2030 is a strategy to foster advanced computing in Portugal within the European context. It focuses on building a high-performance computing (HPC) world-reference network infrastructure to support scientific, innovation, and growth activities.

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[13] https://portugaldigital.gov.pt/wp-content/uploads/2022/01/Portugal_Action_Plan_for_Digital_Transition.pdf
[14] https://www.incode2030.gov.pt/
[15] https://www.iapmei.pt/PRODUTOS-E-SERVICOS/Empreendedorismo-Inovacao/Inovacao-e-Competitividade/Programas-e-iniciativas/Rede-de-Polos-de-Inovacao-Digital.aspx
[16] https://startupportugal.com/

National Data Strategy and National Blockchain Strategy:

These strategies aim to establish frameworks for data management and blockchain technology, respectively. They support the adoption and integration of these frontier technologies across various sectors to enhance transparency, security, and efficiency.

Indústria 4.0 Program[17]:

This program targets the digital transformation of the manufacturing sector by integrating new technologies and fostering innovation to increase productivity and competitiveness. It provides support for implementing Industry 4.0 solutions in manufacturing processes.

Recovery and Resilience Plan (RRP):

Allocating 21.1% of the total budget to digital transition, the RRP includes a specific focus on the digitalization of companies through the C16 component - Enterprises 4.0. This component consists of three investments:

- TD-C16-i01: Digital Empowerment of Enterprises
- TD-C16-i02: Digital Transition of Enterprises
- TD-C16-i03: Catalyzing the Digital Transition of Enterprises

Portugal 2030 Program[18]:

A partnership agreement between Portugal and the European Commission, this program integrates the five European Structural and Investment Funds to promote innovation and the adoption of frontier technologies across sectors such as manufacturing, agriculture, and healthcare.

COMPETE 2030[19]:

This operational program aims to enhance the competitiveness of Portuguese businesses through innovation, providing funding for projects that incorporate advanced technologies like AI and IoT. It targets key sectors such as industry, tourism, and energy to support economic diversification and increased productivity.

Digital Transition Action Plan[20]:

This comprehensive framework outlines measures to support the adoption of digital technologies across various sectors, with a focus on enhancing digital infrastructure, supporting business digital innovation, and promoting digital skills among citizens.

National Innovation Agency (ANI):

ANI promotes innovation by providing funding and support for R&D projects across different sectors, facilitating collaboration between companies, research institutions, and startups to drive technological advancements.

Support for Business Models for Digital Transition (Coaching 4.0):

[17] https://cotecportugal.pt/pt/projects/industria-4-0-fase-i/

[18] https://portugal2030.pt/

[19] https://www.compete2030.gov.pt/

[20] https://diariodarepublica.pt/dr/detalhe/resolucao-conselho-ministros/30-2020-132133788

Part of the national Industry 4.0 program, this initiative encourages the integration of technology in companies, supporting the development of processes and organizational skills for digital transformation.

Startup Portugal:

This initiative supports the startup ecosystem by providing measures such as tax incentives, access to funding, and support for internationalization, aiming to position Portugal as a hub for tech startups.

Digital Innovation Hubs (DIHs)[21]:

Portugal has established several DIHs that promote the adoption of advanced digital technologies in industries like manufacturing, healthcare, and agriculture. These hubs offer services such as technology testing, funding access, and training programs.

AI Portugal 2030:

This strategy targets the diffusion of AI technologies across sectors. It includes funding for AI research, support for AI startups, and initiatives to integrate AI into public services, with specific applications in areas such as precision agriculture, smart cities, and AI-driven healthcare solutions.

These policy instruments demonstrate Portugal's commitment to fostering innovation and economic diversification through the targeted diffusion of frontier technologies across various sectors.

5 - Has your country put in place mechanisms to strengthen industrial capabilities through partnerships among different stakeholders (e.g., university-industry or private-public)?

Yes, Portugal has established various mechanisms to strengthen industrial capabilities through partnerships among universities, industries, and public entities. These collaborative efforts aim to enhance innovation, promote technology transfer, and drive economic growth. Here are some key examples:

Collaborative Laboratories (CoLABs)[22]:

CoLABs are research institutions that bring together universities, research centers, and industry partners to address specific scientific and technological challenges. They focus on applied research and innovation in areas such as digital transformation, health, energy, and materials science, aiming to bridge the gap between academic research and industrial application.

Interface Program[23]:

This government initiative enhances interaction between research institutions and the industrial sector by providing funding and support for joint projects that leverage advanced technologies to improve industrial processes and product development. The Interface Mission is part of the

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[21] https://www.iapmei.pt/PRODUTOS-E-SERVICOS/Empreendedorismo-Inovacao/Inovacao-e-Competitividade/Programas-e-iniciativas/Rede-de-Polos-de-Inovacao-Digital.aspx
[22] https://www.fct.pt/en/financiamento/programas-de-financiamento/instituicoes-de-id/laboratorios-colaborativos/
[23] https://www.ani.pt/pt/valorizacao-do-conhecimento/interface/

national Recovery and Resilience Plan (RRP) and encourages the development of innovative products and services.

CIT – Technology and Innovation Centres:

These centres are Research and Technology Organizations (RTOs) dedicated to producing, disseminating, and transmitting knowledge aimed at companies, contributing to economic value creation and public policy objectives.

Innovation Hubs and Competence Centres:

These centres serve as platforms for collaboration between academia and industry in key areas such as artificial intelligence, cybersecurity, digital health, and smart manufacturing. They support R&D activities, technology transfer, and the development of new industrial capabilities.

National Digital Innovation Hubs Network:

Comprising 17 DIHs, this network provides testing, training, funding, and incubation support for the digital transformation of companies and the public sector. It focuses on three disruptive technologies: Artificial Intelligence (AI), High Performance Computing, and Cybersecurity.

National Test Beds Network:

Aligned with the European Testing and Experimentation Facilities (TEFs), this network offers technical support for testing AI-based software and hardware technologies in real-world environments. Portugal's Test Bed is part of the TEF-Health project.

Inov Contacto Program:

Managed by AICEP Portugal Global, this program connects young professionals with international companies and research institutions to enhance global competitiveness and promote knowledge exchange. It provides opportunities for young talent to work on innovative projects in diverse industrial sectors.

INESC TEC[24]:

The Institute for Systems and Computer Engineering, Technology and Science (INESC TEC) collaborates with various industries to apply AI, robotics, and other advanced technologies to solve real-world problems. Its projects span multiple sectors, including energy, healthcare, and manufacturing, boosting industrial capabilities.

Programa Mobilizador[25]:

This initiative supports large-scale, strategic R&D projects requiring collaboration between companies, research institutions, and public entities. These projects often focus on technological innovation and the development of new industrial capabilities, enhancing the competitiveness of Portuguese industries.

Portugal Ventures[26]:

A public venture capital firm that supports startups and innovative companies by providing funding and fostering partnerships with research institutions and larger corporations. This

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[24] https://www.inesctec.pt/pt
[25] https://www.ani.pt/pt/financiamento/incentivos-financeiros-pt-2020/mobilizadores/
[26] https://www.portugalventures.pt/

initiative bridges the gap between research and market application, promoting the industrial uptake of new technologies.

6 - How can international cooperation support the uptake of new technologies and the development of technological capabilities in your country and ensure that industrial policies will benefit all and do not worsen inequality?

International cooperation plays a crucial role in supporting the uptake of new technologies and the development of technological capabilities in Portugal, while ensuring that industrial policies benefit all and do not worsen inequality. The National Strategy for Semiconductors highlights this, as evidenced by Portugal's engagement in strategic international partnerships.

In 2022, Portugal signed a Memorandum of Understanding with the Spanish Ministry of Economic Affairs and Digital Transformation and the Spanish Ministry of Science and Innovation. This was part of developing an Iberian strategy for microelectronics and semiconductors, resulting in several bilateral meetings and defining key strategic points. These include talent exchange in critical areas such as photonics, chip design, and advanced packaging, and extending collaboration with Spanish entities dedicated to the manufacture of photonic chips. Additionally, there's an effort to establish a back-end cluster in the Iberian Peninsula, complementing activities in Portugal through ATEP Amkor, following Broadcom's investment in Spain for a new factory.

Furthermore, in 2022, the Portuguese Agency for Trade and Investment (AICEP) signed a Memorandum of Understanding with South Korean multinational SK hynix, aimed at developing investments in the semiconductor area in Portugal by 2024. This collaboration extends to academia and research and development, fostering new partnerships between Portuguese and Korean educational institutions dedicated to microelectronics and semiconductors.

Notwithstanding, Portugal believes that international cooperation can support the uptake of new technologies and the development of technological capabilities by fostering new multilateral co-operation initiatives on key issues. This includes policy dialogues and encouraging knowledge sharing, engaging the private sector and civil society. Sharing specific situations that have not contributed as expected to set goals, along with the remedies applied and their results, is also crucial. In particular, international cooperation can be relevant in the following areas:

Access to Funding and Resources:

Participation in European Union programs like Horizon Europe[27] provides financial resources essential for R&D projects. This facilitates the commercialization of new technologies and drives economic growth.

Knowledge and Technology Transfer:

Collaborative initiatives with international research institutions and universities enable Portuguese researchers and companies to stay updated on the latest advancements and best practices. International educational exchanges and training programs enhance the skills of the Portuguese workforce.

Development of Standards and Best Practices:

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[27] https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/home

International cooperation aids in developing and harmonizing standards for new technologies. Aligning with international standards ensures that Portuguese companies remain competitive globally and helps mitigate and anticipate risks associated with adopting new technologies.

Inclusive Growth and Reducing Inequality:

Programs like the European Regional Development Fund (ERDF)[28] aim to reduce regional disparities by funding projects that promote economic and social cohesion. These initiatives focus on enhancing digital infrastructure and skills in less developed regions, ensuring technological progress does not exacerbate inequality.

Capacity Building and Skill Development:

Programs like Erasmus+[29] provide opportunities for Portuguese students, researchers, and professionals to gain international experience and enhance their skills in digital technologies and AI. This builds a skilled workforce capable of effectively utilizing and developing new technologies.

F. Leveraging International Networks and Clusters:

Participating in international networks and clusters[30] helps Portuguese companies integrate into global value chains and access new markets. These networks facilitate the exchange of ideas and technologies, enabling companies to innovate and grow. By being part of these international ecosystems, Portugal can ensure that its industrial policies are aligned with global trends and inclusive.

In summary, by fostering multilateral/international cooperation, engaging in policy dialogues, and encouraging knowledge sharing, international cooperation has contributed to the endeavour of building a more inclusive and sustainable future in Portugal. These efforts drive economic diversification, technological innovation, and ensure that the benefits of technological advancements reach all segments of society.

7 - What can do the UN CSTD to support an economic transformation that enhances your country productive capabilities and foster and inclusive digital transformation?

The UN Commission on Science and Technology for Development (CSTD) can play a pivotal role in supporting Portugal's economic transformation and fostering an inclusive digital transformation through several key actions:

Technical Assistance and Capacity Building:

The CSTD can provide technical assistance and capacity-building programs tailored to Portugal's needs. These initiatives would focus on developing skills and expertise necessary for managing and implementing advanced technologies, thereby preparing the workforce for the digital economy.

Exchange of Knowledge and Best Practices:

Facilitating the exchange of knowledge and best practices among member states, the CSTD can enable Portugal to learn from successful technological implementations and case studies from

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[28] https://ec.europa.eu/regional_policy/funding/erdf_en
[29] https://erasmus-plus.ec.europa.eu/
[30] https://een.ec.europa.eu/

around the world. This knowledge sharing can accelerate Portugal's adoption of digital technologies and enhance its productive capabilities.

Promotion of International Partnerships:

By promoting international partnerships and collaborations, the CSTD can facilitate joint ventures and initiatives that drive innovation and resource sharing. Such partnerships can bolster Portugal's efforts in digital transformation, bringing together diverse stakeholders to work towards common goals.

Support for Policy Development and Implementation:

The CSTD can offer guidance and support in developing and implementing policies that foster economic transformation and digital inclusion in Portugal. This includes advising on regulatory frameworks, funding mechanisms, and strategic initiatives aimed at leveraging digital technologies for sustainable growth.

Fostering Inclusive Innovation Ecosystems:

Initiatives supported by the CSTD can foster inclusive innovation ecosystems in Portugal. By promoting the participation of diverse stakeholders, including women, youth, and marginalized communities, the CSTD can ensure that the benefits of digital transformation are equitably distributed, thereby contributing to reducing inequality.

Monitoring and Evaluation:

Establishing mechanisms for monitoring and evaluating progress, the CSTD can provide regular assessments of Portugal's digital transformation initiatives. This monitoring helps ensure that projects are meeting their objectives and can identify areas for improvement. Continuous evaluation also informs adaptive policymaking to maximize the impact of digital initiatives.