



Business at OECD

SCIENCE, TECHNOLOGY AND INNOVATION POLICIES FOR SOCIETY

Priorities for future OECD work

Established in 1962, *Business at OECD* (BIAC) stands for policies that enable businesses of all sizes to contribute to growth, economic development and societal prosperity. Through *Business at OECD*, national businesses and employers' federations representing over 7 million companies provide and receive expertise via our participation with the OECD and governments promoting competitive economies and better business.

Introduction

The stakes have never been higher for Science, Technology and Innovation (STI) policies. Economic growth and prosperity, responding to pressing societal grand challenges (such as health, energy, water, and environment), national security, sustainability, and competitiveness depend more than ever on STI policies.

Disruptive new trends and technologies now intersect with the evolution of ongoing ones – presenting new opportunities as well as challenges for STI. At the same time, many government STI policies have not kept pace with the accelerating pace of disruptive “game changers” associated with exponential progress, ongoing digital and technology revolutions in multiple domains, compressed time cycles, and innovative new business models.

For business, STI policies and government-business collaboration in scientific research, technology development, value creation, and innovation are more important than ever– especially for basic research, infrastructure, framework policies, and catalyzing early-stage technology. As the engine of innovation and a key driver for STI value creation and societal solutions, business needs to be included as an integral partner in creating and delivering public benefits, economic growth and productivity, and jobs.

Business at OECD believes the time has come to transform traditional STI policies, priorities, and organizational structures to reflect multiple, massive STI disruptions, paradigm shifts, and transitions now underway in the STI environment. In this context, this paper proposes STI priority topics for discussion going forward, benefitting from the OECD’s unique setting that brings together like-minded market-based democracies. These include:

- ***“The New Disruptors”***
- ***The Next Production Revolution***
- ***Investments in Innovation Infrastructures***
- ***Intellectual Property Protection***
- ***Systems-based and coherent STI Ecosystems***
- ***Societal Considerations and STI***

Business at OECD is encouraged by the timeliness and forward-looking focus of the 2019 High-Level Roundtable of the OECD Committee for Scientific and Technological Policy (CSTP). We hope that future dialogue on cross-cutting STI topics which are of particular value to the business community will continue.¹

¹ This paper draws on the practical experience of a wide and regionally diverse business constituency and provides a considered assessment of priority issues that affect its members’ ability to fully embrace the benefits of science, technology and innovation policies. The topics mentioned in the following should be considered in addition to and complement those listed in other *Business at OECD* publications, including [*Business at OECD’s 2019 Contributions to the CSTP High-Level Roundtable*](#).

“The New Disruptors”

STI still is in the early stages of multiple, massive disruptions and transitions which are fundamentally reshaping business. In many cases, STI is no longer largely incremental but disruptive and nonlinear, and marked by new frontiers of research, accelerated technology development, and globalized impacts.

Disruptive new business models are simultaneously transforming STI, business, and business-government collaborations to deliver public benefits. They are enabled and accelerated by a combination of (a) data-driven research and innovation; (b) multiple non-traditional STI participants; (c) enhanced global and regional multipolarity capabilities; (d) new forms of business competition and collaboration; (e) disruptive shifts in traditional research and innovation systems and roles; (f) globalized access to information; (g) a panoply of new tools, platforms, and methods; and (h) the convergence of multiple foundational technologies.

In a quickly changing STI landscape, we are witnessing a move towards problem-oriented, solutions-driven approaches across the STI spectrum, and research and innovation are increasingly disconnected from traditional institutions and policies. It is now possible, for example, to create, develop and scale a disruptive technology outside the boundaries of traditional institutions of research or innovation.

As a result, a widening disconnect exists between both traditional STI mission-oriented programs and “siloed” government organizational structures, and the changing STI landscape, societal and business challenges, and STI frontiers. In this context, OECD and governments should re-evaluate traditional STI policies, including out-dated regulatory bottlenecks and other non-technological barriers, that can stifle innovation and delay the broad diffusion of new tools and technologies.

Business recommendations to OECD and governments:

- Monitor the advance of research and development in order to plan for and assess the impact of new disruptive technologies, and foster exchanges on recent disruptive technology developments, with a view to strengthening strategic foresight and horizon scanning capabilities.
- Undertake additional efforts to understand and embrace how key drivers of disruptive innovation such as AI and data, convergence, exponentials and others are transforming the structure, conduct and sharing of research.
- As *Business at OECD* recognizes a widening disconnect between both traditional STI mission-oriented programs and “siloed” government organizational structures, and the quickly changing STI landscape, societal and business challenges, and STI frontiers, OECD should ensure that governments account for these trends in an efficient way and foster coordinated international approaches to science, technology and innovation.
- Highlight the need for updated regulatory frameworks where necessary to support private sector STI efforts.

The Next Production Revolution

A new wave of technologies - ranging from a variety of digital technologies (e.g. 3D printing, the Internet of Things, advanced robotics) and new materials (e.g. bio- or nano-based) to new processes (e.g. data-driven production, artificial intelligence, synthetic biology) – and their confluence is increasingly transforming production, and will make our economies more efficient, and foster economic growth and wellbeing. Three examples of key drivers of this Next Production Revolution 2.0 include:

- *The Next Wave of Networked Digital Innovation* will transform business and societies through rapid advances in connectivity, automation, and intelligence. The introduction of sensors and the Internet of Things, smarter and more sophisticated algorithms, enhanced network capabilities, and advanced robotic and augmented/virtual reality functionality will combine to drive production systems and global value chains.
- *Synthetic Biology/Engineering Biology* represents a transformational technology platform for production and next-generation manufacturing at the intersection of biology, engineering, and computing. Through the creation of novel biological systems and circuits, synthetic biology offers potential solutions to current challenges in advanced manufacturing, climate change, energy needs, and global health. As living organisms are increasingly programmable, it also opens up new frontiers for research and the industrialization of biology, and allows research and innovative business models to link biological systems with the digital and cyber-physical world.
- *Quantum Computing* has the potential to revolutionize computing by introducing a fundamentally new approach to computing not available with today's computers. Unlike bits in classical computing, qubits can be in combinations of both a 1 and a 0 at the same time due to quantum superposition and have the ability to solve certain types of problems significantly faster than classical computers. Quantum computing has the potential to support significant breakthroughs in medicine, manufacturing, artificial intelligence, defense, and improved cybersecurity.

As we welcome OECD's initial exploration on the implications for governments and businesses, *Business at OECD* encourages the OECD to further build on its work in this regard to fully seize the benefits of the Next Production Revolution.

The focus should of CSTP should be on the development, diffusion and adoption of enabling technologies throughout the economy, including by ensuring adequate digital infrastructures. Further work on institutions with specific remits to aid diffusion, such as technology extension services, may be valuable to support small and medium-sized enterprises (SMEs) benefit from these technological developments.

As the rapid growth of AI, Machine Learning, and Data also change the nature of work, we urge the OECD to work across Committees to enable wide participation in the future of work, and ensure that businesses can draw on a wide pool of talents.

Business recommendations to OECD and governments:

- As the OECD in recent years has delivered high value attention, analysis, and actionable options for the Next Production Revolution (NPR), strengthen and extend initial work to the next wave of research and innovation that promises to be equally disruptive and to offer broad societal benefits.
- Work across OECD Committees to foster skills upgrading, life-long learning and workplace training, and strengthen collaboration between industry education and training institutions.

Investments in Innovation Infrastructures

Public funding for STI stays flat or continues to decline in many OECD countries. However, government investments and other support for science, technology and innovation provide high returns in driving scientific progress, economic value creation, new types of public goods, and the ability to solve societal grand challenges.

Infrastructure that supports knowledge creation, technology development, and economic value is critical, but often eroding or out-of-date. Governments should support the development, adoption, and diffusion of next-generation digital infrastructures, including broadband availability, access to cloud resources, and data exchange platforms and repositories. As STI infrastructure no longer is just about bricks and mortar or equipment, we encourage government policies and funding to support new types of infrastructure such as infratechnologies, prototyping and scaling, metrology, and access to pre-competitive commons.

We recommend governments to expand the financial toolkit for STI beyond traditional mechanisms to ensure innovations continue to deliver high-value to business and society. OECD and governments should also rethink traditional STI public funding, incentives, and R&D tax schemes – including (a) better aligning them to broader societal grand challenges; (b) adopting a technology “portfolio” management approach to foundational and converging technologies; (c) tapping capital markets and private sector investment flows in more innovative ways to support STI and deliver public benefits; and (d) leveraging budgets and scarce resources by reducing bureaucratic silos, avoiding wasteful duplication and administrative research costs, and moving away from “one size fits all” policies.

At the same time, fundamental research and early-stage “de-risking” must remain at the core of government STI policies and funding. Many businesses face challenges that limit their willingness or ability to invest in fundamental science and technology research. Ever shorter product life cycles, pressures for short-term performance from the financial markets and investors, and intense competition all play an important role.

Business recommendations to OECD and governments:

- Highlight the importance of government and private sector investments in STI infrastructure to achieve economic growth and sustainable development, and make significant progress to grand challenges including in the areas of health, energy, and the environment.
- Conduct further work to address the funding/investment gap in the manufacturing-innovation process. Important steps in this regard should include
 - Developing “de-risking” toolkits for funding and investments with business, venture philanthropists, and other key stakeholders;
 - Increasing the role of government-industry-academic collaborations (such as public-private partnerships) and collaborative policies for knowledge transfers, STI co-creation, and shared data commons;
 - Experimenting with new approaches to accelerate and expand lab-to-market translations and to measure what works, and why;
 - Adapting and upgrading not only regulatory processes but also regulatory science so that they do not impede cutting-edge research and innovation in business, universities, and national laboratories.
- Support rethinking traditional STI public funding, incentives, and R&D tax schemes to strengthen sustainable, inclusive, and knowledge-based economic growth.
- Ensure that fundamental research and early-stage “de-risking” remains at the core of government STI policies and funding.

Intellectual Property Protection

STI flourishes when governments recognize the value of placing a robust intellectual property (IP) system at the core of their legislative, regulatory, and judicial frameworks. Where markets are open and IP is protected and enforced, innovators have the legal predictability and certainty they need to share knowledge and intangibles with external partners, engage in research collaboration or international licensing agreements, and invest in markets. *Business at OECD* urges governments to ensure policies and laws neither undermine IP nor harm innovation, or threaten new technologies from entering the marketplace.

In this context, *Business at OECD* and its members are deeply concerned about policies and measures that force technology transfers by restricting market access, or compulsory technology transfer to obtain investment approval or contracts for public procurement. It is important that government procedures including in the context of business registration, certification and approval, as well as product and technology licensing, do not unnecessarily request sensitive proprietary information or require source code disclosures – whether formally or informally. Technology-related performance requirements that impose local sourcing and local content requirements or data localisation may also compel involuntary technology transfers. Joint venture requirements should be prohibited as a condition for market access.

It is critical that necessary cybersecurity policies are reasonable, proportionate and non-discriminatory to safeguard a level playing field for competitors. Beyond critical infrastructures, companies and if necessary governments need to establish cybersecurity standards - where life and limb is at risk in particular - and ensure adequate protection across all IoT-layers, with clearly defined requirements.

Business recommendations to OECD and governments:

- Work across the OECD to ensure that intellectual property rights will be respected and enforced, and that OECD countries follow international best practice in this regard to avoid eroding IP protection.
- Closely collaborate with the Trade Directorate to reinforce analysis in the area of intellectual property and forced technology transfer, including in its work with selected member and non-member economies, to delineate the sometimes “blurred” line between voluntary and mutually agreed upon technology transfer, and quantify the impact of forced technology transfers on trade and investment, individual sectors and OECD economies.
- Ensure that necessary cybersecurity policies are reasonable, proportionate and non-discriminatory to safeguard a level playing field for competitors, and set baseline standards that safeguard confidentiality, authenticity, integrity and availability.

Systems-based and Coherent STI Ecosystems

STI is now increasingly characterized by a complex, interdependent STI ecosystem that requires systems-based approaches, whole-of-government policies and evidence-based feedback. However, most government STI policies have remained too risk-averse, too slow, and too locked into outdated linear based STI policies to adjust.

Business at OECD welcomes OECD's efforts to strengthen system innovation as a horizontal policy approach to use combined technologies and social innovations to tackle problems that are systemic in nature. As OECD governments and societies rely on STI to respond to pressing societal grand challenges including in the areas of health, energy, and environment, we would like to highlight the importance of fostering holistic, coherent and consistent policy-making that embraces private sector innovation.

In this context, we emphasize that many technologies are already available to enable transitions, but without changes to institutions, laws, regulations, market mechanisms and socio-cultural attitudes, many of the solutions fail to scale.

As regulatory sandboxes or innovation-hubs provide an environment in which businesses can test innovative products and services under certain conditions, we recommend OECD to promote such initiatives that can boost new technology-based solutions.

Business recommendations to OECD and governments:

- Following TIP's excellent work on System Innovation, continue to prioritize new elements of systems innovation and STI ecosystems including:
 - Funding follow-on basic research and complex infrastructure that are "feedback loops" from business research, innovations, and market signals.
 - Moving beyond lab-to-market and "valley of death" commercialization policies alone to a range of new needs requiring different policy measures such as: (a) scaling to commercially competitive levels; (b) iterating "design-build-test-learn" engineering cycles for complex processes; (c) developing and deploying predictive tools, modeling, and simulations for real world applications; and (d) delivering common metrology, new types of standardization, and bridging mechanisms across previously separate domains, sectors, and ministries.
 - Repositioning the role of government within the evolving STI ecosystem. This includes new multi-faceted and coordinated roles as partner, catalyst, convener, trusted intermediary, facilitator and co-investor with business, social entrepreneurs and other key players seeking shared 'mission-oriented' outcomes and public benefits.
- Strengthen initiatives that create the right conditions to boost technology-based solutions such as regulatory sandboxes – to suspend regulation proven to inhibit innovation – or innovation-hubs.
- Ensure rapid uptake of new technologies, including through innovative payment models, better recognition of the value of innovation, early-access schemes and regulatory reviews.

Societal Considerations and STI

Considerations about trust, ethics, privacy, cultural values, and responsible innovation no longer are afterthoughts in STI. They increasingly drive business actions, shareholder value, and business models related to STI.

Recent OECD work on AI, neurotechnologies, and synthetic biology, for example, represents high value initial efforts to integrate these considerations into all aspects of STI. *Business at OECD* recognizes the direction of this work but much more needs to be done to integrate societal and ethical issues across the full range of programs in the CSTP and its working parties, such as BNCT, TIP, and the Global Science Forum.

For emerging technologies such as AI and for data usage, adherence to fundamental ethical principles is indispensable. As several International Organizations including UNESCO and ITU are discussing these, OECD should act to support and harmonize these activities and ensure a multi-stakeholder approach to issue or vision sharing.

To strengthen the technology transfer, adoption, use and acceptance of AI, new types of public private partnerships would be required. The data literacy and socio-technical competences of citizens must be improved, including through adaptations of the education system and further outreach activities. In this context, a better understanding of data quality and data bias is crucial to counter bias on grounds of race, gender and other diversity dimensions.

Regarding privacy concerns, coherent guidelines from OECD would be helpful.

In a broader context, *Business at OECD* and its members also would like to emphasize that new societal models are reshaping not only how governments, business, and citizens think about STI but also what the policy priorities of STI should be. Recent examples that are illustrative in this regard are (a) Japan's Smart Society 5.0; (b) Germany's Industrie 4.0; (3) the bioeconomy and circular bioeconomy; and (4) STI for achieving the U.N. sustainable development goals ("STI for SDGs").

Business recommendations to OECD and governments:

- Emphasize how considerations about building trust, trustworthiness, and transparency increasingly drive shareholder welfare, business models and actions.
- Integrate societal and ethical issues across the full range of programs in the CSTP and its working parties, such as BNCT, TIP, and the Global Science Forum.
- Draw on new societal models that are reshaping not only how governments, business, and citizens think about STI but also the policy priorities of STI, and integrate societal and ethical issues where necessary in the CSTP and its working parties, such as BNCT, TIP, and the Global Science Forum.

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