# Innovation in Japan Today — a Driver of Economic Growth or a Factor in Societal Transformation?

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## Policy Context in Japan

On March 1, 2013, I was appointed as an executive member of the Council for Science and Technology Policy for the second time, by the newly re-elected prime minister, Shinzo Abe. The difference from my first term is that, this time, I became a fulltime member — meaning full engagement and more responsibility — and this within the context of the urgent need for an early economic recovery of Japan.

Indeed, after three consecutive recessions and under the pressure of deflation, the priority of the Abe administration was the restoration of a robust economy, beside the continuing engagement for recovery from the Great East Japan Earthquake. All policy tools had to be mobilized, to start with, by implementing "bold monetary policy", "flexible fiscal policy" and the "Japan Revitalization Strategy", driven by structural reforms. The fact is that I took my office in the midst of the emergence of so-called Abenomics.

The Council was called to take a leading role through promoting innovation, in line with the basic understanding of innovation as a driver of economic growth. According to the Cabinet Office Establishment Law, the Council for Science and Technology Policy (CSTP) was charged to:

- Investigate and discuss basic policies concerning Science and Technology (S&T)
- Investigate and discuss S&T budgets and the allocation of human resources
- Assess Japan's key research and development.

Alongside these basic functions, the need to contribute to the Revitalization Strategy led to enlarging the CSTP's competencies, that was done in May 2014 with the enactment of the modified Act for Establishment of the Cabinet Office. The CSTP became the Council for Science, Technology and Innovation (CSTI), and henceforth the CSTI is responsible for formulating science, technology and innovation policy and ensuring its sound implementation.

The Council did not wait for the acquisition of this legal basis to act. In June 2013, in order to enhance measures to promote science, technology and innovation a "Comprehensive STI Strategy" was formulated. This Strategy is comprised of long-term vision and immediate action items. Since then, two new programs, namely the "Cross-Ministerial Strategic Innovation Promotion Program" (SIP) — aiming at fostering coordination and collaboration among ministries — and the "Impulsing PAradigm Change through disruptive Technologies Program" (ImPACT) — providing room for high-risk/high-impact research — have been initiated by the Council.

Last year, the Strategy was revised as the "Comprehensive STI Strategy 2014" in order to further accelerate our efforts, keeping in mind our ultimate goal to transform Japan into a "most innovation-friendly country" and integrating the fact that Tokyo has been chosen to host the 2020 Olympic and Paralympic Games.

Following the general election last December, Abe's third Cabinet is expected to tackle substantial structural reforms, and the Council will be accompanying this endeavour by enhancing and consolidating Japan's innovation capacity, this within the context of an ever more competitive international environment. Japan possesses a huge potential of human and knowledge capital, but they still have to be fully exploited. Thus, there is a need for a drastic, rather than incremental, policy response, which means we should be ourselves "innovative" in formulating innovation policy.

In the following, after a brief review of the OECD work on innovation in view of understanding the policy significance of innovation, we will examine where Japan stands today in terms of science, technology and innovation (STI) based on some data. We will then present succinctly the "STI comprehensive strategy" and newly created programs by the CSTI, identifying key policy challenges Japan is facing in terms of innovation. Finally we will focus on the societal aspects of innovation, which lie behind these challenges and then conclude.

## OECD Work on Innovation

The OECD promotes policies to enhance people's well-being, and from this perspective the Directorate for Science, Technology and Innovation (DSTI) is charged to examine the contributions of STI toward this goal, to provide a forum for dialogue and to advise member and non-member countries how to better formulate STI policies based on their policy analysis, data sets and intellectual assets.

At its Council at Ministerial Level 2010, the OECD delivered a report on Innovation Strategy titled "Innovation to strengthen growth and address global and social challenges — Key Findings" as a response to the pressing demand expressed by member countries in search of new sources of growth. It stipulated that:

> *"New sources of growth are urgently needed to help the world recover from the economic crisis and move towards a more sustainable growth path. Innovation — which involves both the creation and diffusion of products, process and methods — is a critical part of the solution. It provides the foundation for new industries, businesses and jobs. Innovation-led growth can also provide the "head room" that will make it easier for governments to address pressing social and global challenges, including climate change. Moreover, it can do much to help address these*

*challenges at the lowest cost. While not a solution to all the world's ills, innovation is an important tool that can and should be better utilised."*

And it proposed five policy principles:

- Empowering people to innovate
- Unleashing innovations
- Creating and applying knowledge
- Applying innovation to address global and social challenges
- Improving the governance and measurement of policies for innovation.

Since then, in most countries, innovation has tended to be mainstreamed alongside their basic monetary and fiscal policy tools, providing stimulus packages, in particular investing in knowledge infrastructure and human capital.

Alongside these guiding principles, with growing expectations on innovation expressed by policy makers, a better understanding of the functioning of innovation ecosystems was an urgent need. The DSTI tends to respond to questions such as how key actors interact to make innovation happen, the mechanism through which innovation occurs, what are the framework conditions for innovation, and what are the impacts of locality — regional, national and global dimensions of innovation — through its subsequent publications, release of new indicators and a measurement agenda (http://www.oecd.org/site/innovationstrategy) and its "OECD country reviews of innovation policy" (www.oecd.org/innovation/reviews).

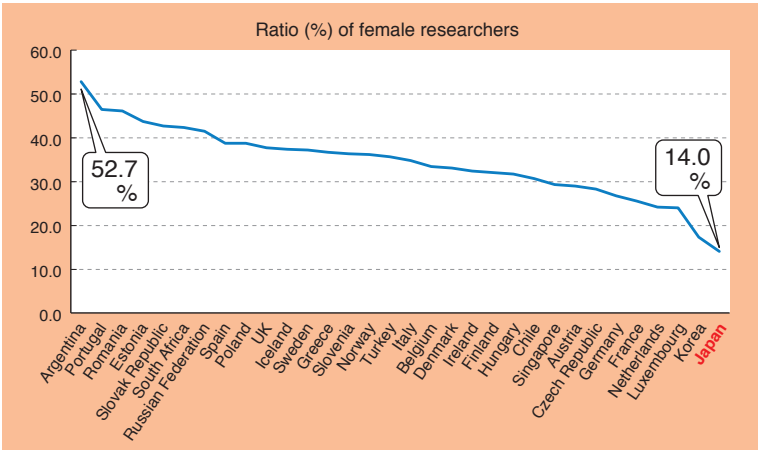
Also, the way and the place innovation occurs evolve constantly, within the ever-changing environment — the growing economic influence of emerging countries, the emergence of a "data-driven economy", increased connectedness, and frequent occurrences of global crises. Therefore the Innovation Strategy will be revised during the course of 2015, in order to:

- Bring new insights to the relationship between innovation and policy
- Identify new areas for policy actions
- Revisit framework conditions for innovation
- Explore governance issues with a view to implementing a coherent cross-government agenda (called "whole-of-government approach") for innovation policy.

Enhancing the capacity to innovate is critical now more than ever for all governments seeking growth, wealth and sustainability. The OECD's work is expected to support them not only in implementing "innovation policy" but also in proceeding to a reality check and policy learning.

CHART 1

**Human resources**




*Note 1: Statistical data for 2011*
*Note 2: Data missing for some countries including US*
*Source: OECD, Main Science and Technology Indicators database, June 2014*

## Where We Are Today

We now turn to investigating where Japan stands today regarding STI. In terms of research and development (R&D) expenditures as a percentage of GDP, Japan is constantly above the OECD average, exceeding the EU Horizon 2020's target of 3%. Given the large contribution of the private sector, it illustrates the potential for growth. These last few years we have observed a significant increase in the number of Nobel Prize Laureates in Japan, the fruit of continuing efforts in science and engineering over a number of decades and the call for balanced and sustained public R&D investment. However, in terms of innovation, the picture is more nuanced. According to innovation indicators, such as the Global Innovation Index (GII), Japan stagnates at a low level, in particular due to its capacity to provide "creative output".

Based on these facts, the hypothesis of a "missing link between science and innovation" is often advanced. To fulfill this missing link, different channels within national innovation systems had to be exploited, and this thinking placed university-industry collaboration as a high priority on the policy agenda.

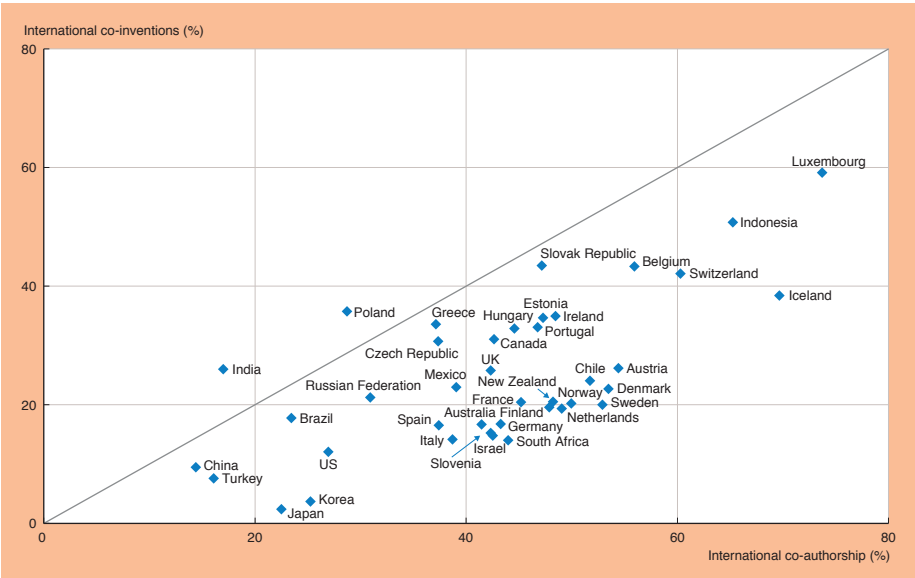
Also, "diversity" — generally recognized as a source of inspiration and creativity — remains a missing piece of the Japanese innovation landscape. Indeed, from the gender perspective, the ratio of female researchers, at 14% *(Chart 1)*, places Japan at the bottom of the major industrialized countries. Inter-university mobility of faculty remains below 5% in all age groups, indicative of a preference for stability and limiting the window of opportunity to experience diversity. Also, given the fact that Japan has a low score on both international co-authorship and international co-invention *(Chart 2)*, and that the scientific production relies heavily on researchers, who are rooted in Japan, diversity in terms of international background or international experiences seems to have a minor impact on S&T productivity. That is to say, promoting diversity will be full of pitfalls and meet strong resistance, since diversity goes against historically constructed and consolidated practices, especially at a time when cross-fertilization of ideas is needed more than ever.

## New Framework for STI

These observations led the CSTP to take action. Indeed, in 2013, under the newly formed Abe Cabinet, the CSTP was assigned to formulate a so-called "Comprehensive Strategy on Science, Technology and Innovation" (hereafter "Comprehensive Strategy on STI") by the prime minister, in view of Japan's New Growth Strategy. The first

CHART 2

## International collaboration in science & innovation




*Note: International co-authorship of scientific publications is defined at institutional level. A scientific document is deemed to involve an international collaboration if there are institutions from different countries or economies in the list of affiliations reported by single or multiple authors. Estimates are based on whole counts from information contained in the Scopus® database (Elsevier B.V.).*

*International co-inventions are measured as the share of patent applications filed under the Patent Cooperation Treaty (PCT) with at least one co-inventor located in a different country in total patents invented domestically. Patent counts are based on the priority date, the inventor's country of residence and whole counts.*

*Israel: The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities or third party. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law. It should be noted that statistical data on Israeli patents and trademarks are supplied by the patent and trademark offices of the relevant countries.*

*Source: OECD (2013), OECD Science, Technology and Industry Scoreboard 2013: Innovation for Growth, OECD Publishing, Paris http://dx.doi.org/10.1787/sti_scoreboard-2013-en*

Comprehensive Strategy on STI was adopted at the Ministerial Meeting in June 2013, and was revisited the following year, to take account of the changing environment surrounding innovation and to better respond to policy challenges. Thus Japan acquired a new framework for STI, beside its five-year Science and Technology Basic Plan (S&T Basic Plan), providing a basic orientation for S&T policy for the years of coverage. Indeed, the Comprehensive Strategy on STI is expected to function as a complement to the latter, by providing actionable policy recommendations, which could be implemented in the short term.

The Comprehensive Strategy on STI (2013), guided by three principles — act "smart", implement "system" thinking, and think "global" — is composed of three pillars:

1. Grand policy challenges
2. Structural reforms of national innovation systems
3. Empowerment of the CSTP.

Regarding the first pillar, the CSTP, as responsible for formulating STI policy and ensuring its sound implementation, has identified five grand challenges to be tackled:

- Realization of clean and economical energy
- Realization of healthy and active aging
- Development of next generation infrastructures as a top-runner in the world
- Regional revitalization taking advantage of regional resources
- Early recovery and revitalization from the Great East Japan Earthquake.

And for each of these challenges a roadmap has been formulated and key actors identified, in order to make available innovative solutions in a timely manner, mobilizing Japan's capacity in S&T.

The second pillar, "Structural reform of national innovation systems", has the ultimate goal of making Japan a "most innovation-friendly country" as advocated by Abe. In this task, the CSTP developed a three-step approach, namely "nurturing the sprouts of innovation", "activating the innovation systems" and "fructifying innovation", accompanied by focused measures for each of them that place great emphasis on people, institutions and systems. Here again, "diversity" is considered as essential, as well as the capacity to act across borders — disciplinary, structural, institutional, geographical and cultural.

Finally, with its third pillar, the CSTP proposed to equip itself with a new competency, designing and implementing programs promoting innovation with its proper budget, with the aim of better driving efforts made at ministerial level. It required a revision of the Act for Establishment of the Cabinet Office, the legal basis of the CSTP. In May 2014, the Diet voted on proposed amendments to enlarge the CSTP's competencies — this competency among others — and to change the name of the CSTP to "Council for Science, Technology and Innovation (CSTI)", as mentioned in the first section.

The CSTI moved one step further with its Comprehensive Strategy on STI 2014. The roadmaps of grand challenges have been updated and consolidated around the newly created SIP. With regard to the structural reforms, the CSTI proposed to take actions to enlarge opportunities for "challenges" and "interactions" by bridging ideas, facilitating mobility of people and creating a different type of innovation hub. Also the CSTI deserves credit for putting the newly created ImPACT at the heart of its policy tools.

## New Schemes: SIP & ImPACT

In this section, we proceed to a brief overview of SIP and ImPACT.

### Cross-Ministerial Strategic Innovation Promotion Program (SIP)

SIP aims at strengthening Japan's economy and industrial competitiveness through innovation, by putting into practice a whole-of-government approach in selected themes of interest from the societal point of view, in connection with the grand challenges mentioned in the Comprehensive Strategy on STI.

What is new here is its approach. A program director (PD) is

nominated for each theme. Backed by an executive team and equipped with a large decision-making capacity, his/her tasks consist of designing, implementing and managing a five-year program, coordinating related ministries and institutional actors, working hand in hand with business sectors, and recommending regulatory reforms if necessary. He/she is expected to gather actors and make them work together beyond the existing borders of disciplines, institutions, sectors, and ministries, in order to address societal challenges. The CSTI assumes the role of screening key themes, selecting PDs, allocating budgets, and proceeding to a timely follow-up. In short, SIP is designed to be an "innovation accelerator" and the CSTI is there to ensure its good governance.

For the fiscal year 2014, the CSTI selected 10 themes, such as "next generation power electronics", "automatic driving systems", "infrastructure maintenance, renovation and management" and "disaster prevention", headed by five PDs coming from academia and five others with an industry background.

### Impulsing Paradigm Change through disruptive Technologies Program (ImPACT)

ImPACT may be considered as a complement to SIP. Indeed, it aims to generate groundbreaking innovation, which will bring drastic changes to industries and society if realized. That means we seek through ImPACT the next generation of innovation by investing in high risk but high impact R&D.

In this exercise, the CSTI decided to propose five grand themes — sufficiently abstract to leave room for innovative ideas, but precise enough to express the government's concern about the key societal challenges — and proceeded to a call for proposals to select so-called program managers (PMs). In their attribution, PMs have a certain analogy with SIP's PDs, such as allocation of a large decision-making capacity, preference for a cross-border approach, and responsibility to design, implement and manage a five-year program, while PMs are expected to bring disruptive ideas to be a "game changer" in innovation.

Twelve PMs have been selected by the CSTI, taking into account the diversity of the field of coverage, technological challenges, approaches, professional background, age and gender. They are solicited to share among themselves their experiences as PMs, as they are "explorers" of a new profession in the Japanese context.

The essence of these two programs can be summarized as follow:

- Their primary objectives remain "achieving economic growth" together with "addressing societal challenges"
- Through inventing these new schemes, the CSTI intends to provide a space for experimentation, where one can test new types of team-making and governance, discover new players, and learn from failure.

Promoting innovation requires an innovative policy approach. The CSTI attempts to move in this direction, and to gain the confidence and commitment of key stakeholders. By pushing one step further, we can ask if these trials are enough to induce societal transformation leading to achievement of the ultimate goal of "most innovation-friendly country". We will discuss this in the last section, by focusing on one of the critical elements sustaining innovation — "diversity" — to grasp its value in the Japanese context and to identify policy challenges.

## Value of Diversity

Tokyo will be hosting the Olympic and Paralympic Games in 2020 for the second time, having staged its first Olympics more than 50 years ago. At that time, Japan was just entering into a period of postwar recovery, while consolidating its path to economic growth. The Olympic Games were a strong signal that "Japan was back" on the international scene.

This success did not come about by chance, but was the result of determined efforts by individuals sharing a common goal and the values of teamwork, and also of investment in technology and human capital by private companies with a strong focus and potential on incremental, rather than radical, innovation. And people were confident they were on the right path. There was a social cohesion in the value of common efforts, although limited room was reserved for those who thought differently and not necessarily in line with mainstream thinking.

While Japan has gained significant maturity in terms of economic and social institutions over these last 50 years, as well as in standard of living, the world is evolving ever faster, as illustrated by the emergence of global value chains, the rise of emerging countries, and the development of the Internet of Things, to name a few. Due to these waves of change, what made Japan successful is no longer a guarantee of tomorrow's success.

The world is entering into a new era of innovation, and tremendous opportunities for exploiting new ways to create knowledge and businesses are there. To be active in this context, or ever better to be a driver of these transformations, means to be able to put transformative ideas into action beyond existing or foreseeable business structures, given that these challenges are socially accepted. The attitude of the "follower" and Japan's past experience of success may act against this needed social acceptance.

Japan has demonstrated its capacity to transform constraints into advantages in the past. It must demonstrate this capacity again, not only by mobilizing its technological strength, but also, or in particular, readjusting its "gender balance", leaving room for "differences" and being "globally connected". The huge potential of Japan's human and knowledge capital is there, just waiting to be exploited.

The CSTI, in its capacity to formulate the S&T Basic Plan, which lays the foundation for the basic policy of Japan's science and technology initiatives, is currently developing the Fifth S&T Basic Plan for the period from 2016 to 2020. Given the context within which Japan stands today, as described above, the CSTI will have on its agenda not only the formulation of policy recommendations for enhancing innovation, but also the promotion of diversity within the Japanese STI community — a big challenge since it will open doors to societal transformation. JS

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