RESOURCE PAPER 54

INDO-JAPAN CHAMBER OF COMMERCE & INDUSTRY

'Bridging Innovation: India–Japan Technological Diplomacy in the 21st Century'

by
Ms. Maithili S. Sane

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PREFACE

Dear Readers,

The India-Japan partnership has far-reaching implications for the global technology ecosystem and the dimensions of geopolitical partnerships in the Indo-Pacific. The Resource Paper on 'Bridging Innovation: India-Japan Technological Diplomacy in the 21st Century' has come out at a very appropriate time, as the year 2025-2026 is being commemorated as India-Japan Year of Science, Technology and Innovation Exchange.

The Resource Paper analyses the various aspects of Japan-India Technological Diplomacy over the years and provides a constructive agenda for future cooperation and collaboration. The author, without any prejudice, has listed out the hiccups and provided solutions subtly.

I am happy to introduce the author, Ms .Maithili S Sane, Assistant Professor at the PG Department of International Studies, Women's Christian College, Chennai. She is also a doctoral candidate at the Department of Politics and Public Administration, University of Madras, having submitted her thesis on 'E-governance in Judicial Administration in India'.

She is an expert in Law and Public Administration, has taught courses on Constitutional Law, International Law and Contemporary Developments in World Affairs. She has published several research papers and articles in peer reviewed journals and books. Ms. Maithili is the recipient of an award from the then Vice President of India, Shri M. Venkaiah Naidu for her essay - 'One Nation, One Election'. She has participated in the UN International Trade Law Competition at Vienna, Austria.

I hope our readers find the resource paper interesting and informative.

April 2025

Suguna Ramamoorthy
Secretary General, IJCCI

‘Bridging Innovation: India–Japan Technological Diplomacy in the 21st Century’

Introduction

Technological co-operation had always been a domain for inter-state co-operations, but hitherto technology was restricted to playing a supportive role in issues of national interest, communications and economic growth. ICT in the 1990’s was predominantly understood as ‘computerisation’ of routine manual tasks. However, all this has changed with the advent of the 4th Industrial revolution and the tremendous potential of e-governments, generative AI and the increased adoption of technology by industries. In fact, according to Gartner Inc, global spend on IT in 2025 is expected to total $5.61 trillion, an increase of 9.8% from 2024[1]. In other words, technology has now become a pivotal player in State and Non-State agendas.

This is why in recent times, the concept of ‘Tech Diplomacy’ is gaining traction. Although there is no formal or academic definition of this term, the explanation given by Brazil’s Deputy Consul General and Tech Ambassador in San Francisco USA, Euegnio Vargas Garcia is oft quoted - “Tech diplomacy is the conduct and practice of international relations, dialogue and negotiations on global digital policy and emerging technological issues among states, the private sector, civil society and other groups”. Countries are now increasingly appointing technology ambassadors or ‘tech diplomats’ to further foreign policies related to technological cooperation. This is infact another dimension to Joseph Nye’s Soft Power theory.

Japan and India are no strangers to the advent of this tech diplomacy. In fact, a decade ago in 2015, Japan appointed the first Science and Technology Advisor to the Ministry of Foreign Affairs. Currently this position is held by Dr. Kotani Mokoto. Additionally in 2023, the Japanese Ministry of Foreign Affairs also appointed ‘Science and Technology

[1] https://www.gartner.com/en/newsroom/press-releases/2023-05-24-gartner-forecasts-worldwide-government-it-spending-to-grow-8-percent-in-2023

Fellows' in diplomatic missions to strengthen tech diplomacy in certain establishments. These Fellows will not only monitor latest trends in Science and Technology but rather also explore technological liasoning between respective governments. India is one such country among 6 overall where these Fellows have been currently appointed by the Government of Japan.

In comparison, in India a new division was created at the Ministry of External Affairs in 2020 called as The New and Emerging Strategic Technologies Division (NEST) with the ostensible aim of monitoring technological opportunities and challenges, understanding the international legal system related to technological developments and to develop India's foreign policy vis a vis technological cooperations.

Leveraging these aspects, the potential for a robust tech diplomacy and innovation based partnership between India and Japan is tremendous. Today, the ICT sector contributes over 13% to India's GDP and India aims to grow this to 20% of predicted GDP by 2025. Additionally, by the end of this decade, India's digital economy is set to surpass traditional sectors and contribute nearly 1/5th of national income. Key growth drivers include the rapid adoption of AI, cloud services, and the rise of global capability centers (GCCs), with India hosting 55% of the world's GCCs[2]. According to the State of India's Digital Economy Report 2024[3] India is the third largest digitalized country in the world (behind US and China) in terms of economy-wide digitalization (Japan ranks 9th in this report).

On the other hand, the ICT sector contributes to 10% of Japanese GDP according to the White Paper released in 2024 by the Japanese Ministry of Internal Affairs and Communications. Japan's overall ICT market is expected to grow at a compounded average growth rateof more than 7% during 2023-2028 to reach over $470 billion in 2028 particularly driven by the Society 5.0 initiative.

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[2] https://pib.gov.in/PressReleaseIframePage.aspx?PRID=2097125

[3] Released by the Indian Council for Research on International Economic Relations and can be accessed at https://icrier.org/publications/the-state-of-india-s-digital-economy-report-2024/

At the same time, it is pertinent to note that both countries face several challenges in leveraging the optimum potential of their ICT sector. For instance, while the Indian economy is fast being digitized, the average citizen is not yet fully integrated into the system. This is why the State of India's Digital Economy Report 2024 places India in the 12th position, three lower than Japan amongst the G20 economies when it comes to user connectivity. Similarly, while Japan is a leading manufacturer of technology products, its digital economy is not performing too well amongst other economies. For example, the World Digital Competitiveness Ranking 2024 (WDC) released by the IMD places Japan at 31st rank and India at 51st amongst the 67 economies studies. (Within Asia – Pacific region, Japan ranks 7th and India 11th)[4]. Interestingly, for both countries, scores have declined over the past five years having ranked higher in 2020.

On this backdrop, this paper explores the evolution of India-Japan technological cooperation followed by an analysis of potential areas for successful technological partnerships between the two. The challenges to such tech diplomacy are then examined before concluding.

Evolution of Indo-Japan technological co-operation

While Indo-Japan co-operation in general is traced to historic times through religious and civilizational linkages, diplomatic co-operation formally commenced in 1952. The interactions mainly focused on political and economic aspects including trade and foreign aid. Space collaborations did begin in the 1960's; however, Science and Technology Co-operation between the two countries formally began in 1985 through an MOU between India's Ministry of External Affairs and the Japanese Ministry of Education, Culture, Sports, Science and Technology. While this was foundational in nature, it laid the path for establishment of a joint committee, research and development co-operation, technology transfers and capacity building. For an India embarking upon her then PM Rajiv Gandhi's dream of making the country ready for the 21st century through innovation and technology, this MOU came at a crucial juncture. Today, as we commemorate 40 years of this agreement, 2025- 26 has been

[4] https://imd.widen.net/s/xvhldkrrkw/20241111-wcc-digital-report-2024-wip

declared as the India-Japan Year of Science, Technology and Innovation Exchange.

Following this, some key initiatives included the establishment of the India-Japan Science Council (1992)[5], the India-Japan Co-operative Science Programme (1993) which included computational science amongst other focus areas, the 2005 agreement between ISRO and Japan Aerospace Exploration Agency (JAXA) to explore outer space co-operation, and the 2006 MOU between Japanese Science and Technology Agency (JST) and India's Department of Science and Technology (DST).

With the evolution from Global Partnership (2000) through the Global and Strategic Partnership (2006) to the current Special Strategic and Global Partnership (2014) between the two countries, technological cooperation between India and Japan also shifted from supportive programs to joint collaborations and partnerships. The 2011 Comprehensive Economic Partnership Agreement identifies ICT and S&T specifically as fields of cooperation. Additionally, it includes several articles on adoption of technology across other spheres such as energy, trade and customs, IPR, and businesses.

In 2015, a Strategic International Cooperative Program between DST and JST was launched to promote several collaborative activities for functional applications of Physical Sciences in ICT. Three joint laboratories were established in the areas of Mobile Big Data Analysis, security in Internet of Things and Data Science for Sustainable farming practices.

One of the key agreements was the 2018 India-Japan Digital Partnership signed as a Memorandum of Co-operation between the two countries. Recognizing the potential of AI and Internet of Things in government and business fields, this agreement aimed to initiate a Japan-India Startup Initiative, Digital Corporate Partnership and create an Electronics Ecosystem. Additional focus areas included digital security, capacity building, R&D and funding.

[5] The role of this Council however has now ended with the advent of more specific bilateral treaties and agreement. The last meeting was held in 2019 in Tokyo.

In 2021, the first India-Japan High Level Policy Dialogue on Environment was launched. A workshop held under its aegis focused on newer fronts of collaboration including hyrdogen technology, district cooling systems and agrivoltaic practices. Considering that Japan had expertise on low carbon technology, India requested Japan to join the Leadership Group for Industry Transition - a global initiative founded by India and Sweden. Japan is a member of this group today and both countries have agreed to the target of net zero carbon emissions by 2050 from heavy industries. This is particularly relevant for the Japanese economic model. Furthering technological cooperation in the environmental sector an India-Japan Fund of $ 600 million was launched in 2023 by the India's National Investment and Infrastructure Fund and Japan Bank for International Co-operation. The fund will promote Japanese investments in India centered around environment sustainability and low carbon emission strategies.

Space co-operation is also emerging as an important dimension of Indo-Japan relationship. Lunar cooperation, peaceful use of outer space, satellite image sharing, disaster management through remote sensing, are some of the areas on which agreements have been signed. Currently, while ISRO and JAXA are exploring a joint lunar mission, the third India-Japan Space Dialogue occurred recently in April 2025 indicating again the use of diplomacy to further understanding and collaborations in this sector.

With semiconductor manufacturing becoming a key industry for India, Japan with its proven leadership in chip manufacturing is an ideal partner. India not only has a huge demand for semiconductors but the market size is set to grow by 26 percent by 2032. Coupled with the loss of global market share in this industry by the Japanese (from 50% in 1980's to 10% in 2024), the chip sector is an area of mutually convergent interests and concerns. While there are earlier agreements on this, in 2023, both countries have agreed for creating a more resilient supply chain for semiconductors and jointly work to develop a robust ecosystem. The partnership will focus on five areas: 'semiconductor design, manufacturing, equipment research, establishing resilience in the semiconductor supply chain and talent

development', paving the way for government-to-government and industry-to-industry collaborations[6].

Not just through bilateral agreements, but tech diplomacy has been utilised by India and Japan via various multilateral processes as well. For instance, in 2021 the QUAD created a critical and emerging technology working group to focus on supply chains, telecommunications and development of technology standards for critical technologies. The same year, India and Japan have also specifically agreed to focus on 5G, submarine fibre optic network, smart city technologies and telecom security. In 2023, QUAD announced cooperation with Palau to establish Open Radio Access Network. This is not only the first such initiative in the Pacific, but also represents the increasing investment of QUAD priorities in the technological sector. Similarly on the sidelines of the 2023 G7 summit in Japan, India discussed potential collaborations on green hydrogen and digital public infrastructure.

Under the UN SDG's, a Global Pilot Programme on Science, Technology and Innovation is envisaged wherein India is a pilot country and Japan is her partner country. This is a unique partnership under the Technology Facilitation Mechanism wherein both countries will also support SDG projects in Africa and other developing countries. Thus, a bilateral co-operative mechanism is utilised for multilateral benefit. The idea is to share knowledge, experience and capabilities through the South-South and Triangular Co-operation under the UN mandate.

Potential for a successful technical co-operation between India and Japan

In 2024, the Japanese Bank for International Cooperation conducted a survey of Japanese manufacturers with overseas business operations subsidiaries. The 2023 survey in addition to its usual focus areas of overseas business performance, business prospects for medium term and promising countries also added newer dimensions to manufacturers perception of global supply chain, impact of global price hikes and issues of

[6] https://www.orfonline.org/research/a-fab-way-to-conduct-india-japan-tech-diplomacy

sustainability[7]. In these rankings, India retained her top position with a wide margin indicating that Japanese manufacturers regard her as the most ideal place to do business in the next 3 - 10 year span.

This is not surprising given the oft quoted synergies and complementarities between the economies of both countries. First, while Japan has proven track record in technological prowess, India has emerged as a leader in software development. Second, Japan is set to face shortage crunch of approximately 1,80,000 software engineers by 2030 according to Japan External Trade Organization. The country can leverage India's human resource capital in this regard. Japan has already eased Visa regulations for Indians and residency permits to Highly Skilled Professionals in this regard. Third, while currently India holds the world's largest IT startup ecosystem, it faces a challenge when it comes to hardware and funding - again two areas where Japan prowess can address the gaps. Investments from Japanese companies and funds are also on the rise in India, especially in the startup landscape. Japan's Incubate Fund Asia which has set aside a corpus of USD 50 million for investments in early-stage startups in India is a case in point.

Fourth, as the World Digital Competitiveness Ranking 2024 cited above indicate, between the two, India ranks higher in Knowledge while Japan ranks higher in Future Readiness indicating a potential synergetic area.

Fifth, there are several sectors which can be considered as newer areas of partnership between the two countries. For example, renewable energy is an area where India and Japan can strengthen technical co-operation. India currently has largest renewable energy capacity targets in the world. In COP26, India was ranked 4th in installed renewable energy. According to the report released by India's Central Electricity Authority, the share of renewable energy generation in India is projected to increase from 42% to 64% by 2029-30[8]. Japan on the other hand has developed cutting edge technology in renewables through green hydrogen, bioethanol, decarbonization initiatives, bio-jet fuel to name a few. Given India's market

[7] https://www.jbic.go.jp/en/information/press/press-2023/press_00148.html

[8] https://cea.nic.in/wp-content/uploads/irp/2023/05/Optimal_mix_report__2029_30_Version_2.0__For_Uploading.pdf

potential in this sector, collaboration between the two countries in renewables makes sense from both business and sustainability standpoint.

Similarly, Electric Vehicles (EV's) are fast becoming a priority sector for India and Japan both. Switching to EV's is indispensable for India's zero net carbon emission targets. In 2021, India announced an accelerated and ambitious target of EV penetration up to 70% for commercial cars, 30% for private cars, 40% for buses, 80% for two and three wheelers by 2030. To achieve this, India needs a robust infrastructural support, reduced manufacturing costs and technological prowess - all of which can be ably met by Japan. Japanese companies such as Mitsubishi, Suzuki, Toyota and Terra Motors Corporation have made foray in several key technologies such as liquid lithium batteries, super-efficient charging stations, battery swap technologies and enhanced production processes. All these companies are currently investing at various levels in India's EV sector. In 2023, Musahi Seimitsu Industry Co. Ltd has promised an investment of $700 million in this sector. Suzuki Motor Corporation chose India as the first country as a hub for exporting EVs, and plans to export India made EVs to Japan by 2025[9].

Sixth, considering that India is the fastest growing economy today and its manufacturing sector GDP comes predominantly from the Small and Medium Scale Enterprises (SME's), this market is a hub for potential innovations and partnerships. Make in India, Production Linked Incentive Scheme and Skill India Mission have been launched ostensibly tooptimize the potential in this sector. This is where Japan, with its excellent manufacturing capabilities, Society 5.0 policy and being the fifth largest FDI to India can leverage these aspects for a mutually beneficial partnership. Japanese FDI is currently channeled into the automobile, railways, electronics and pharmaceutical sectors in India. However, investments by Japanese SME's into Indias SME sector is an underutilized partnership which can be truly transformative. Japan can benefit from a resilient supply chain, lower manufacturing costs, availability of abundant labour, vast market access and India's strategic location. India can benefit

[9] https://www.businesstoday.in/latest/corporate/story/suzuki-plans-to-export-india-made-evs-to-japan-from-2025-report 402475-2023-10-18

from technology transfers, employment creation and skill development. An SME Facilitation Cell was launched in 2023 in the Embassy of India, Tokyo. It is hoped that both countries utilise the tremendous potential of this hitherto unexplored partnership.

Finally, geopolitical tensions and supply chain disruptions affect both countries in the Indo-Pacific region. For instance, the U.S's CHIPS and Science Act of 2022 places restrictions on semiconductor manufacturing by countries which pose a direct threat to the US. This is an opportunity for both India and Japan to consolidate their respective strengths in the semiconductor industry and collaborate in the Indo Pacific. An attempt is already being made to diversify supply chains and develop resilient networks independent from the US-China-Russia factors. This is also relevant from the standpoint of national security and strategic interests - especially the defence sector. This is another area where both countries need to explore mutually beneficial collaborations apart from traditional defence trade partner dependencies.

Challenges to India-Japan technological cooperation

Every partnership between governments is bound to face hurdles and India and Japan are no exceptions to the rule. The India-Japan technological partnership, while marked by mutual respect and a shared vision of regional stability, faces a range of structural and strategic challenges that inhibit its full potential. Despite their complementarities, the collaboration has often faltered due to differences in regulatory frameworks, business culture, and strategic priorities.

One of the most significant challenges is the lack of policy alignment and regulatory predictability in India, which acts as a deterrent for long-term Japanese investment in high-tech sectors. Japanese companies, known for their meticulous planning and risk aversion, often find India's bureaucratic procedures opaque and time-consuming, particularly in sectors such as telecommunications, infrastructure and defence production. India's evolving data privacy laws, digital tax regulations, and localization requirements have further added to the complexity, making Japanese tech firms cautious about scaling operations.

Japan's strong emphasis on intellectual property protection and high-quality standards sometimes clashes with India's frugal innovation ecosystem, which prioritizes cost-efficiency and accessibility over cutting-edge sophistication. This divergence affects not only product development but also collaboration in frontier technologies like artificial intelligence (AI), robotics and smart manufacturing. In many cases, Japanese firms are reluctant to transfer critical technologies due to concerns about IP enforcement and lack of high-quality infrastructure and manufacturing capabilities on the Indian side.

Similarly, when it comes to Startups despite India's burgeoning start-up ecosystem, Japanese venture capital investment is heavily concentrated in a few unicorns and rarely extends to early-stage deep-tech innovations.

Another challenge lies in the absence of robust institutional mechanisms for technology transfer. While several MOU's have been signed between Indian and Japanese ministries, think tanks, and research institutions, the translation of these agreements into tangible, scalable outcomes remains limited.

Cultural and linguistic barriers also play a significant role in slowing down the partnership. While Japan has made concerted efforts to internationalize its workforce, English-language proficiency remains low, which complicates coordination with Indian tech teams. Conversely, India's limited knowledge of Japanese business etiquette and hierarchical decision-making styles often leads to misunderstandings or missed opportunities. Moreover, Japan's preference for long gestation planning contrasts with India's often reactive and politically-driven decision-making process, making it difficult to sustain long-term strategic cooperation.

In the strategic domain, Japan's close alignment with Western powers and its alliance with the United States occasionally creates friction, especially as India attempts to balance multiple partnerships, including with Russia and other Asian powers.

Furthermore, defense technology collaboration, although encouraged by high-level dialogues, has remained limited in scope, often due to Japan's constitutional constraints on arms exports and India's insistence on co-development and local production under the "Make in India" initiative.

There are also asymmetries in R&D capabilities and investment flows that hinder an equitable partnership. Japan's private sector leads global innovation indices and allocates a significant percentage of GDP to R&D, while India's investment in R&D remains below 1% of GDP (0.64%), with limited private sector participation. This imbalance makes it difficult to establish joint ventures as equal stakeholders. Japanese firms often view India more as a market or manufacturing base than as a partner in cutting-edge innovation. The need for skill development and tech infrastructure enhancement in India is thus urgent if it is to attract Japanese investment beyond traditional sectors like automobiles and consumer electronics.

Finally, geopolitical uncertainties and supply chain vulnerabilities pose an overarching challenge. The COVID-19 pandemic and rising tensions in the Indo-Pacific have triggered discussions on supply chain diversification and economic security. While this provides an opening for India-Japan collaboration through initiatives like the Supply Chain Resilience Initiative (SCRI), India's lag in logistics performance and inconsistent quality control have made it less competitive compared to Southeast Asian nations like Vietnam and Thailand, which are also courting Japanese investment.

Concluding remarks

In summation, while the India-Japan technological partnership is underpinned by shared democratic values, economic complementarities, and a mutual interest in ensuring a stable and secure Indo-Pacific, it continues to face formidable obstacles that must be systematically addressed for the partnership to achieve its full transformative potential. Despite repeated affirmations of goodwill and high-level diplomatic engagements, the structural asymmetries in regulatory environments, research capacities, cultural expectations, and strategic outlooks present enduring barriers to deep, sustainable cooperation.

The issue is not a lack of interest or intention, but rather the absence of enabling conditions and trust-based systems that can facilitate seamless collaboration. India's aspirations to become a global innovation hub and manufacturing powerhouse require not only domestic reforms but also the

integration of its innovation ecosystem with trusted international partners. Japan, with its advanced R&D capabilities and experience in building high-quality infrastructure, remains a natural and strategic ally in this regard. However, to leverage this partnership effectively, India must offer greater regulatory clarity, faster dispute resolution, and improved intellectual property protection. Concurrently, Japanese stakeholders must be willing to move beyond cautious incrementalism and invest more deeply in India's vibrant startup scene and its emerging deep-tech ventures.

Cultural literacy and mutual understanding between institutions, researchers, and businesses must also be prioritized. Government-to-government dialogues need to be supported by people-to-people engagement, exchange programs, and co-innovation platforms that allow Indian and Japanese professionals to build long-term, trust-based relationships. Strategic dialogues like the Quad and SCRI should serve as platforms to align technological standards, share best practices, and ensure that the partnership is resilient to geopolitical shocks and supply chain disruptions. More importantly, both nations must recognize that their technological cooperation cannot remain confined to transactional engagements; it must be part of a broader strategic vision aimed at shaping the regional and global technology order.

In light of the global trend toward techno-nationalism and digital sovereignty, India and Japan are uniquely positioned to craft a model of equitable, secure, and transparent technological partnership that others can emulate. But this will require a shift from symbolic gestures to structural investments-investments in regulatory harmonization, joint R&D, human capital development, and co-manufacturing ecosystems. As the world becomes increasingly polarized around technology blocs, the success of the India-Japan technological partnership could serve as a defining example of how democratic nations can collaboratively shape a rules-based and innovation-driven digital future.

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