An Indian Approach to Technology Diplomacy

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Executive Summary

The Information Age has brought the role of technology in foreign policy to the forefront. Nation-states now rely on technological growth, comparative advantages and supply chain dependencies as elements that contribute to technology's heightened role in diplomacy. This discussion document addresses how technology can be used as a credible diplomatic plank by the Indian State to further its national and geopolitical interests through a comprehensive 'techplomacy' strategy.

The key takeaways from this document are:
1. The Indian state should focus on key areas of strength in its technology ecosystem, which can serve as potential tools of diplomatic leverage.
2. The concept of self-sufficiency in emerging technologies must be re-examined with the Indian state championing and fostering multilateral efforts in its tech diplomacy outreach.
3. India can learn from its neighbour, China, and its 'techplomacy' efforts to simultaneously increase its sphere of influence as well as grow technologically at the domestic level.
4. Major policy pushes at the ministry level, such as the appointment of a science and technology (S&T) ambassador, along with expanding the roles of existing S&T counsellors from the IFS, must be implemented.

I. Introduction

Diplomacy has been a tool of statecraft that addresses the objectives of the State nationally and internationally. With time, diplomacy has gradually co-opted multiple disciplines as levers to achieve diplomatic goals. A state's emphasis on diplomatic efforts strives to achieve three goals:

- One, the talks and engagements for the advancement of the state's national goals
- Two, efforts to address any cross-border challenges and interests of the state
- Three, contribute as a responsible entity to address global challenges that require international cooperation

Technology remains a rare solution with the potential and ability to cover all three diplomacy objectives.[1] With improved accessibility and adoption, technology has necessitated critical policy decisions at the global level. Some great examples include regulatory instruments such as technical standards and export controls and the first-ever global agreement by the United Nations (UN) on the Ethics of Artificial Intelligence and its applications, signed by over 190 countries to date.

Technology diplomacy is usually coalesced into the concept of science diplomacy. Even the majority of the states, including India, refer to 'Science and Tech Diplomacy' in their official documents. Science diplomacy mainly concentrates on collaborative efforts in scientific research in critical domains. Tech diplomacy is when the products or services of scientific research can be used in diplomatic engagements. It deals primarily with crafting foreign policies around the applications of emerging technologies like artificial intelligence (AI), renewable energy technologies, and semiconductor chips, among many others.[2] The field also encompasses the global governance mechanisms of these critical technologies and their applications.

Let's consider an instance in the semiconductor value chain to highlight the difference between science and technology diplomacy. It is a known fact that Silica is the most used raw material for manufacturing semiconductor chips. But there has been a recent rise in other composite semiconductors such as Gallium Nitride (GaN) and Silicon Carbide (SiC). Nation-states coming together to invest and indulge in R&D to develop

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alternatives to Silicon for semiconductor hardware is a form of science diplomacy. There has also been a rise in the military applications of semiconductor chips. Now, nation-states coming together to develop a governing mechanism to regulate any kind of dual-use applications of semiconductor devices is an example of technology diplomacy. This paper, in particular, focuses only on the technology diplomacy aspect. It seeks to understand the role of technology in international governance and in diplomatic initiatives. This study is inclined towards how diplomacy can play a role in functioning existing or potentially new technologies rather than focusing on international collaboration to develop new technologies or alternatives to existing ones.

The 21st century has seen an overhaul of how diplomacy is being conducted. While defence and national security remain at the forefront of diplomacy, there has been a lot of movement toward the economic and technological domain regarding investment, trade and joint ventures.[3] 2021 saw the announcement of the first-ever Trade and Technology Council (TTC) between the United States (US) and the European Union (EU), showcasing the importance of technology trade itself.[4] The EU-India TTC agreement was announced in early 2022, providing an opportunity for both entities to build their technology stack.[5] With tech emerging as a talking point in all discussions, its role in diplomacy remains critical as we move into the next few decades. Understanding the historical significance of how technology has shaped international relations from an Indian and foreign perspective is imperative.

To understand the impact of science and technology (S&T) on a state's diplomatic relations, it is helpful to look at specific countries that have consistently relied on their technical prowess to shape their foreign policy and achieve their strategic goals. Technology has positively served their domestic economies and raised the stature of these States in the global world order.

Dating back to the founding of the modern United States of America, the state has created an atmosphere for scientists and engineers to play an important role in international treaty negotiations and promote the US's interests abroad through officers at different embassies. Two American founding fathers, Benjamin Franklin and Thomas Jefferson served as the country's first unofficial scientific diplomats.[6] Their travels across then-developed Europe helped them gather scientific and technical knowledge that proved critical when formulating policies for a young US nation-state. Not only did this

serve as a plank for creating a technological power, but it also helped the state understand and value the role of science and technology in diplomacy.

Coming to the 21st century, the US has created a position of a Science and Technology Adviser (along with a working group under him/her) to the Secretary of State. This was intended to engage the domestic tech sector with other like-minded nations to build resiliency in certain critical technology areas. A considerable move forward was the establishment of the Regional Technology Officers positions as a pathway for Foreign Service officers within the government.[7] The Global Chief Technology Officers Roundtable series initiative was proposed to showcase the policy intent of the state to use technology as a diplomatic tool in all its future engagements. The agenda of the US government in the field is to become the global leader that protects its own national interests while advocating freedom, democracy and protection of human rights while using critical and emerging technologies.

In the case of another power, Japan, science and technology found a mention in the official government documents related to diplomacy. The Diplomatic Bluebook of 2017, published by the Ministry of Foreign Affairs, notes that 'Japan, through cooperation in science and technology, has been contributing to the development of the field at home and abroad, the promotion of relations with other countries, the peace and stability of the international community, and the resolution of global challenges.' Japan is also placing emphasis on the effective promotion of "science and technology diplomacy" through the activities of the Science and Technology Advisor to the Minister for Foreign Affairs.[8]

By using Japanese technology to contribute to the growth of developing countries, the country has relied on its indigenously developed technology and systems to increase its influence beyond its borders. This landmark policy decision differs from the past when Japan just relied on global outreach to improve its scientific and technological growth.

Similarly, other technological powers, such as South Korea and the EU, are slowly adopting technology as part of their diplomatic outreach.[9] This is being done from a geopolitical and domestic economic perspective.

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The following part of the paper covers the historical decisions taken by the Indian state to integrate technology into the foreign policy and diplomacy realm. This is followed by a framework with principles and strategies to tackle India's approach to the field of technology-driven diplomacy. Finally, the paper delves into some of the landmark policy decisions other technological powers took when integrating technology into diplomatic initiatives and the lessons that the Indian state can draw from them.

II. India's Historical Tryst with the Field

The government of India, driven by the nation's technological growth, has gradually embraced the concept of integrating technology into achieving national and geopolitical goals.

The STIP Connection

The Science, Technology and Innovation Policy (STIP) 2013 was one instance that an intersection of technology and diplomacy found a mention in an official government document.[10] The document states that the 'policy framework will enable strategic partnerships and alliances with other nations through bilateral and multilateral cooperation in science, technology and innovation. Science diplomacy, technology synergy and acquisition models will be judiciously deployed based on strategic relationships.

This was further cemented in the most recently released draft STIP-2020 document.[11] It discusses the role of science and technology (S&T) in reorganising India's foreign policy priorities and shaping the global system with the country's science and technology.

The STIP-2020 draft also advocates developing a 'Proactive Science, Technology and Innovation (STI) Diplomacy Strategy' for India. The proposed strategy addresses crucial global issues concerning the field, such as technology governance, standards, ethics and dual-use capabilities. The approach mentioned in the document looks to utilise S&T to build on existing relationships and forge new ones with diplomatic partners.

There are three main aspects as part of the STI Diplomacy Strategy in the STIP-2020 document:

> 1. India's membership and its scientific personnel's participation in S&T-focused strategic multinational groups and consortia. This would ensure the state's presence to raise India-centric issues during key decision-making processes.

2. Development of International Knowledge Centres to improve access to human resources. The rationale behind this remains the people-centric approach to promoting global knowledge and cross-border talent exchange in emerging technologies.

3. Expanding the role of current Indian S&T counsellors in other countries and reviewing each one's role periodically. This is included to empower the state-appointed officers to promote greater collaboration between the governments and scientific communities in both countries.

However, the STIP documents have been more of vision and mission statements. While it's a positive step that the government has decided to focus on including science and technology as part of its diplomatic outreach, it's imperative to understand the country's capacity to design and implement the proposed strategy successfully.

The MEA Push

There has also been considerable movement on the political front regarding the role of technology in diplomacy itself. In 2015, Prime Minister Narendra Modi asserted that science and technology would be put at the forefront of India's diplomatic engagement in the future.[12] In 2020, the Ministry of External Affairs (MEA) created technically specialised divisions within the ministry, such as the Cyber Diplomacy Division, E-Governance and Information Technology Division: and the New Emerging and Strategic Technologies Division.

The New Emerging and Strategic Technologies (NEST) Division within the MEA is meant to evaluate emerging technologies from an Indian national interest perspective.[13] The division also has been assigned the responsibility of negotiating at global technology multilateral forums on behalf of the government of India. As per the answer to a Lok Sabha question in February 2020, the Minister for State, V. Muraleedharan mentioned that the NEST division within the MEA was set up to deal with technology diplomacy and international legal aspects concerning emerging technologies. The Minister also stated in his reply that the existence of the NEST division would enable more active participation of India in global forums concerning technology governance and help promote the state's interests at the international level.

The Cyber Diplomacy Division has been actively engaging with its foreign counterparts since its inception two years earlier. The 6th India-EU Cyber Dialogue (2020), 4th India-Japan Cyber Dialogue (2022) and 5th India-UK Cyber Dialogue (2022) were conducted and presided over by representatives from the Cyber Diplomacy division. The division also handles all bilateral and multilateral engagements related to cybersecurity. The Quad Fact Sheet of the May 2022 summit mentions the creation of the Quad Cybersecurity Partnership spearheaded by the foreign ministries and their respective cyber teams of the four countries.[14] The division is also in charge of launching the Cybersecurity Day campaign for all states across the Indo-Pacific region.

Finally, the Science Wings Abroad programme under the MEA has missions in Berlin, Moscow, Washington, and Tokyo to understand the international developments in critical areas of science and technology.[15] Facilitating interaction between governments, academia, and industry leaders, the Science Wings programme seeks to promote Indian interests on the global level. The counsellors (also called technical liaison officers) posted at these missions act as the point of contact for any other state or non-state actor seeking collaboration in different areas of S&T.

Technology Oriented Agreements

Apart from India's policy directives, the government has been incorporating technology into different diplomatic agreements, especially with established technological powers. These agreements are in the interest of utilising outside support to build India's technical competency and technology-based alliances.

The India-UK ties have catered a lot towards the technology field in recent years. The Clean Energy R&D Centre was established to ensure the joint development of green and sustainable technologies. The establishment of the NASSCOM-Tech UK alliance and the UK-India Tech Cluster programmes are also crucial steps toward the enhancement of technological cooperation between the two countries.[16]

The US-India Science and Technology Endowment Fund is an instance of the country's turn to technology for a joint initiative to invest in the research and development of critical technologies.[17] The EU-India Joint Information and Communication Technology (ICT) Working Group and the Cyber Security Dialogue are examples of technology serving as a base for conducting diplomatic engagements.[18]

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India has also dabbled with technology at multilateral forums by coming together with like-minded nation-states for effective technology governance and strengthening supply chains. By using technology as a base for diplomatic engagements, states have also understood the ability to improve domestic technology ecosystems in their respective countries.[19] Investments in the start-up space, educational scholarships for students in the STEM field, and joint infrastructure development for technology research and development are some initiatives that have been taken when using technology in multilateral efforts. With the current geopolitical tensions spilling over to the technological domain, it has also offered states an opportunity to promote similar value systems to form an alliance to counter their adversaries.

For example, the Quad (of which India is a part) has brought together states with different comparative advantages to join in various technology areas. The recently held summits in 2021 and 2022 mention creating an Emerging Technology working group for the alliance to handle all tech-related outreach. Areas like 5G diversification through O-RAN, the semiconductor supply chain initiative and technical standards contact groups were some ideas that were part of the group's responsibilities. India's leadership role in creating the International Solar Alliance (ISA) to build solar energy capabilities as a credible renewable energy source also showcases how technology diplomacy has proved pivotal in taking on global challenges.

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III. A Strategy for India's Tech-Driven Diplomacy

The framework utilising technology as a base for diplomatic negotiations rests on three main underlying guiding principles. While the principles ensure a long-term vision, the framework also includes a couple of examples of strategies for each principle that are broad-based recommendations for the Indian state. This will effectively set the pathway for any current and future administration of the Indian state to employ technology as a strategic diplomatic tool.

Principle 1: Focus on Areas of Strengths in India's Technology Stack

India has traditionally relied on its culture, food and even its film industry to appeal to a global audience. While these can remain the country's go-to tools for a favourable international image, technology is a low-hanging fruit for the country to employ in its soft power arsenal. The increase in the development of low-cost technologies can help India successfully use its technology resources as a gateway to advance its foreign policy objectives through non-coercive means.[20]

The primary task for employing technology as a soft power tool is to pinpoint certain tech-driven areas that the country has built expertise. Once identified, these areas can be concentrated and developed further. Investment by the state (financial and human resources) in these critical areas can cement India's leadership credentials in that particular domain. These areas of strength, when identified and developed, can translate into Indian influence in the global tech landscape.
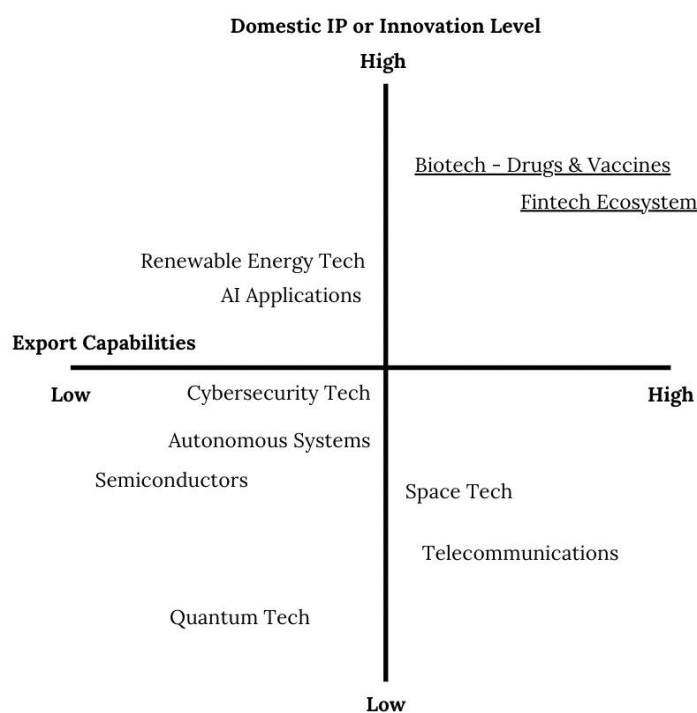
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Figure 1: Framework for assessing India's technological strengths

Based on the above framework, two main areas which the Indian state can use to enhance their diplomatic credentials through the technology space include:

Large-Scale Digital Payments Ecosystem

The last two decades have witnessed India leapfrog many more technologically advanced states in some areas. Technical competency has already been achieved in key domains. The digital payments system in the country serves as a perfect example. In a country of 1.2 billion people, with the majority of the workforce in the informal sector, India has relied on traditional currency to conduct business and transactions for a long time.[21] The introduction of the United Payments Interface (UPI), supported by the government of India, proved a tectonic shift in the payments system for the country. Implementation of this technology on a large scale catering to Indian society was deemed unthinkable in the past but has proven to be a winner.

The seamless transfer of money across bank accounts or digital wallets has improved financial inclusion in Indian society as well as become a key driver for payment applications. Domestic companies like PayTM, PhonePe, and Mobikwik have come up

catering to the vast user base, and companies like BharatPe have developed applications specifically for merchants to use UPI and boost financial inclusivity. Some of them (PayTM and BharatPe) have already achieved unicorn status, showcasing the industry's growth. Multinational companies like Google, Amazon and Facebook have started their financial services business, integrating UPI into their portfolio in the country.

Other than UPI, the introduction of RuPay back in 2012 by the National Payments Corporation of India as a financial and payments service provider has taken off in the country. Now an alternative to international merchants like Visa and Mastercard, RuPay has also attained international acceptance.[22]

An open and multilateral digital system of payments that has been developed in a society of India's scale can be pushed for adoption in different countries. This can serve as a perfect soft power opportunity for the Indian state to set up its payment systems in key allied countries. A key diplomatic win would be when India's existing digital payments system becomes a globally accepted standard. This is already underway, with four states (Nepal, Bhutan, Singapore and UAE) already having accepted and using India's payments system. It has also penetrated the markets of Europe, with France becoming the first European country to accept and use UPI and RuPay.[23]

The Biotechnology Space - Drugs and Vaccines

It is known that one of the major strengths that India possesses in the science and technology space is its domestic pharmaceutical industry. Currently ranked 3rd in terms of pharmaceutical production by volume and 14th by value in the world, the Indian pharma industry includes over 3,000 drug companies indulging in R&D. It is one of the few areas where there is extensive homegrown research and IP development.

In terms of global presence, India's share of exports has been continuously on the rise, with the exports of drugs and vaccines reaching $24.6 billion in 2021-22. The industry has seen a phenomenal growth rate of almost 103% from the period 2014-22, rising from $11.6 billion to the current $24.6 billion.[24] For context, India remains the world's largest supplier of generic medicines and drugs, accounting for 20% of the global demand. One of the critical aspects of this rise includes the standards of the domestic manufacturing facilities in the sector. Indian facilities have already met the high standards set by the FDA, reaching a high stature internationally.

India has also been at the forefront of vaccine manufacturing and its diplomacy. The Covid-19 pandemic offered a great opportunity for India to showcase its expertise and competency in the supply of vaccines to different countries. The government, with its agencies such as the Indian Council of Medical Research (ICMR) and the Department of Biotechnology (DBT), worked with major private sector labs to expedite and fund vaccine research.[25]

India's strength in this space lies in its ability to manufacture large quantities of critical doses of vaccines in short periods of time. The Serum Institute of India is the world's largest vaccine manufacturer, with India's total output being close to around 3 billion doses every year. Out of this, 2 billion doses are exported each year, and India's contribution to vaccine diplomacy through UNICEF hovers around 60% of the total doses.[26]

During the Covid-19 pandemic, India's efforts to bring the vaccine to the developing world were applauded despite the country having to vaccinate its 1.3 billion population. The Indian and South African governments worked together to waive patent rights on humanitarian grounds. The government also spearheaded the Neighbourhood First Policy by supplying vaccines to all countries in the Indian subcontinent. Other states across the globe, such as Brazil and Jamaica, also benefited from India's vaccine diplomacy efforts.

This has made India a torchbearer in the public health space forging new ties between countries. It is imperative that India utilises its position in the global market demand for opening new avenues in international cooperation. The biotechnology sector remains an area of strength for the country, with more firms indulging in R&D and manufacturing each year.[27] This is an opportunity for the state to showcase its benevolence and improve its soft power using public health as a base. Positive externalities in the form of improving access to healthcare are a crucial by-product of a potential diplomatic outreach by India on this front.

The Indian state should persist with building on its strengths in key domains such as those listed above for engaging in diplomacy. It should also identify other domains where the country can make a mark in the global technology order.

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Principle 2: Foster Multilateralism as a Necessity for Tech Development

In the technology domain, there needs to be a change in attitude with respect to the role of diplomacy. It should be noted that there are no national industries but the existence of global supply chains. So the role of diplomacy will be central, not secondary.

In the technology sphere, diplomacy is not about seeking entry into an exclusive alliance or club but about maximising a state's integration with the existing global value chains. Multilateralism in different critical and emerging technology fields should be more of an entrepreneurial decision to improve access and combine scientific or technical knowledge. In that regard, promoting the growth of open source technologies (and built on open standards) which have very little or no entry barriers in the form of licences and royalty fees, must be made a priority on the multilateral front. This can engage more stakeholders, improve accessibility and can increase multilateral efforts toward technology dissemination.

But even with the case of open technologies, India must walk the talk. During the development of Covid-19 vaccines, there was a call by the developing countries to remove the intellectual property and licensing restrictions on Covid-19 vaccine research for public health reasons. However, even after the conversation on open vaccines at the World Trade Organisation (WTO), the Indian government did not open up the tech behind India's indigenous vaccine, Covaxin. Hence, if India wants to lead and engage in multilateral efforts, then opening up its own domestic technology IP to the world should be a priority.

India, in specific, will benefit from being integrated into the global technology ecosystem and diplomatically engaging with other like-minded nation-states. This would achieve its key objectives of economic integration as well as governance participation in the technology realm. A couple of strategies to achieve that include,

Focus on Specific Areas of Technology Supply Chains

A key component of technology supply chains has been the concept of comparative advantages. There are varied aspects of the supply chain that different countries contribute towards. These states' contributions depend on the type of requirement and

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the resources that the state possesses, i.e. their comparative advantages. With each stage of a technology supply chain having different requirements in terms of skill, different sizes of the workforce and even access to raw materials, states have developed expertise in different parts of the supply chain itself.

The past few years have also showcased how small changes to cross-border economic operations can have major consequences. The existing global chip supply shortage is a case in point. Techno-nationalist tendencies among existing tech powers have also increased restrictions on technology cooperation. Additional barriers such as export control mechanisms and import restrictions on technology goods or services have also hampered the efficiency of these supply chains.[28] With the existing delicate nature of technology supply chains, there have been talks about the need to secure them by eliminating many dependencies. One way is through building collective expertise across multiple actors in parts of the supply chain to make the entire chain more resilient. India's tech diplomacy approach can contribute to this.

With India's principle of fostering collaboration in the technology sector, the state's outreach to its allies should revolve around its contribution to the supply chain itself. Diplomatic relationships can be strengthened when India can also prove to be a credible and necessary partner in contributing to restructuring existing technology supply chains. In short, India should strive to become an indispensable asset in critical technology supply chains by focusing on and developing expertise in specific value chain areas according to its comparative advantages.

Let's take the example of the semiconductor supply chain. From the stage of design to manufacturing to assembly, testing and packaging, the entire sequence is a complex process.[29] There are also caveats regarding specialised manufacturing equipment and raw materials for fabrication. The differing level of expertise in stages and the need for specific materials have created a supply chain with multiple actors. The pandemic exposed the weakness of the supply chain resulting in a massive global chip shortage. India can use its comparative advantage in the semiconductor industry to contribute to the initiative.[30] India's large semiconductor design workforce can prove to be pivotal to churning out better and more efficient chip designs in the future.

Similar to the semiconductor supply chain, India needs to understand its strengths (raw materials, data, human capital etc.) in other domains and build on them to become a key player in crucial technology supply chains. This can increase the state's diplomatic leverage as well as ensure that India remains a force to be reckoned with in any emerging and critical technology.

Leading Multilateral Efforts to set Tech Governance Norms

A critical aspect of technology governance and diplomacy is setting norms and guidelines through tech standards. These standards serve as the guiding principles for using and functioning certain technologies, paving the way for effective technology governance. The entities or actors setting the technical standards have the ability to dictate the terms and conditions with which critical technologies operate across the globe. Economically, setting standards can yield benefits in terms of royalty payments and licensing fees. Technologically, standards can control innovation and force states and private sectors to work within their governance framework.

In recent times, there has been an increased role of states in setting these standards, thereby making it a field of geopolitical interest also. China's assertiveness in the technology standards domain has come to the forefront in recent years. The increase in Chinese nationals for leadership positions in key working groups and technical committees across international technical standard-setting bodies has caused concern among the Western powers and other democracies.[31] In early 2020, there were also talks on the Chinese state starting the 'China Standards 2035' project, which aimed at setting technical standards in key technology areas by the year 2035.[32] The success of China in setting the majority of the 5G standards and owning the highest number of 5G-related patents have created ripple effects in the global technology landscape. In October 2021, the Chinese government released the 'National Standardisation Development' outline, which was the first official national strategy toward technical standardisation.[33]

India, as part of its diplomatic technology strategy, should kick start talks on ensuring the joint development of these technology standards in critical technology areas. A key component of this would be India's role in reaching out to other techno-democracies to develop and push forward credible standards at international standard-setting bodies. A techno-democracy alliance, which India can be a part of, has the technological capability to pursue the research and development of standards. This can help in both reducing the

expansion of the Sinosphere as well as counter the increasing influence of Chinese technocrats at international standard-setting bodies. In the Information Age, it is not just the market dominance that matters but controlling the governance mechanisms of critical technologies themselves.

Along with digital infrastructure, there are also reports of how the BRI project has managed to export even Chinese technology standards to the African continent.[34] Hence, states in Africa are coerced into working with Chinese technology products as well as working within the Chinese governance frameworks and mechanisms through their set standards. This has majorly improved China's soft power capability and increased its global technology reach.

The recently proposed T-12 (or the Technology 12) alliance is a perfect platform for India to improve its diplomatic technology outreach through the standards aspect.[35] The alliance, comprising the US, UK, France, Germany, Australia, Canada, Japan, South Korea, Finland, Sweden, and likely India and Israel, has the combined technological expertise to spearhead the joint development of technical standards adhering to the democratic value system in contrast to the China technology model itself. In an era of information warfare, cyber threats and possible state surveillance, the T-12 alliance can help prevent the misuse of emerging technologies from being used as target weapons by setting standards that govern the way these technologies are used. India, as a techno-democracy, can play its role in contributing to the joint collaboration of technical standards-setting processes.

Principle 3: Learning from China's Techplomacy Efforts

One of the main arguments for states to indulge in technology diplomacy in recent times has been the rapid rise of China. The last two decades have seen the Chinese state leapfrog many technologically advanced states in critical technology domains such as quantum information science and the electric vehicles ecosystem. Immense state support, coupled with the rise of domestic technology giants, has made China a major power competing to secure technological space with other powers like the US and Europe. There is also the issue of how the Chinese state has been actively promoting and exporting its technology infrastructure beyond its borders, thereby increasing its sphere of influence.

This expansion of the technology-oriented Sinosphere has made other states take cognisance and increase diplomatic outreach to counter China's ever-increasing growth. However, India, as a responsible technological power, can learn from China's tech-driven influence in the following ways:

Export Tech Infrastructure through Foreign Policy Projects

One of the key ways that some states have effectively utilised technology for diplomacy is through the export of domestic technology products and services across the border. This can be seen in Japan, with Japanese technology and products dominating certain international markets.[36] There is also the concept of integrating technology into key foreign policy projects. China's Belt and Road Initiative (BRI) serves as a model example. The BRI project, which includes states across the Indo-Pacific region all the way to the continent of Africa, has been touted as more than just an infrastructure development project. The Chinese government has exported digital infrastructure (hardware, software, networks and systems) with the help of their domestic private sector giants to many BRI partner countries.[37]

India can rely on its own foreign policy projects and initiatives to build digital infrastructure beyond its borders. This will ensure two things: One, it will build and support a robust domestic technology industry capable of competing on a global scale. Two, these digital infrastructure projects using Indian technologies (equipment, software etc.) will serve as strategic assets for the state and help increase the footprint of the Indian technological ecosystem. It can also create crucial technology partnerships and alliances with other countries that share similar value systems with the Indian state.

An initiative that India can work on with this strategy is the International Solar Alliance (ISA). Spearheaded by India and France, the state can use its clout and status in the grouping to help other countries part of the alliance set up solar-related infrastructure on their soil. The Union government's recent budget (the financial year 2022-23) also provided a massive impetus to the solar energy sector to improve its manufacturing capacity.[38] Specific grants have been awarded to develop solar panels and electric vehicle (EV) batteries. India has traditionally relied on its neighbour, China (the biggest solar energy exporter in the world), for importing solar hardware for panels and large-scale solar farms in the country. This push by the government is to reduce dependency and increase the domestic manufacturing capacity of critical solar hardware.

There is also a thriving solar industry coming up in the country. Giants like Adani Solar and Suzlon have managed to build a vast solar infrastructure. They have also been successful in R&D breakthroughs related to solar energy. The Indian state, with its government push and a developing private sector, can utilise its position in the ISA to build solar energy infrastructure across different countries. It can also help developing countries achieve their climate goals and improve their renewable energy capacity. India's diplomatic clout as a torchbearer for the developing world in tackling climate change can increase with its commitment to building such technology infrastructure across its borders.

Similarly, India should focus on its other foreign policy initiatives and projects that can help it improve its tech outreach and, at the same time, build a world-class domestic technology sector for some critical domains.

Focus on Key Battlegrounds of Digital Competition

A major technological cold war which is being fought in the background is the battle to increase one's technological footprint across the developing world. With the rise of China, state and non-state actors (like multinational tech companies) supported by the state, looking to cement their sway in developing countries that are still looking to increase accessibility and reduce technology services costs.

The expansion of the Sinosphere has been targeted the same way, with the Chinese state actively pushing for their consumer tech to be adopted in regions such as Africa, Central Asia and South East Asia.[39] The state has actively used its foreign policy projects, such as the Belt and Road Initiative (BRI), to get more partners on board and convince them to use technologies developed by China and its technology companies. The state has also effectively employed its growing domestic private sector conglomerates to set up technology infrastructure on the soil of its BRI partners.[40]

A case in point is the rising influence of China across the African continent. The Chinese government has given the responsibility to technology giants like Huawei and ZTE to build telecommunication products and infrastructure across many African countries. The Digital Silk Road initiative of the BRI has taken off in African countries with many consumer tech projects such as data centres and network infrastructure. Huawei and its components make up almost 70% of the total 4G networks across the continent. The

security concerns surrounding Huawei and Chinese technology have been mitigated by the low prices (in terms of installation costs and running the network) offered by Chinese technology firms.[41] This has made African governments embrace Chinese technology firms due to lesser barriers to technology acquisition.

Data centres have been built by Huawei in major countries like Ghana, Nigeria and Egypt. Information and Communication Technology (ICT) infrastructure in other countries like Sierra Leone and Senegal has been dominated by China's Digital Silk Roads project.

Considering the security concerns and the possibility of the Chinese state using its technology infrastructure for illegal surveillance, India can position itself as a possible low-cost alternative to Chinese technology in these digital battlegrounds. The Indian state's main focus should be diplomatic outreach through its domestic private sector firms to help set up infrastructure in regions still developing technologically. For example, Indian telecommunication firms such as Airtel and Jio can be used to set up 5G networks in regions like Africa and Latin America, which rely on foreign import of technology.

IV. Further Policy Push

Historically, trade and technology transfers have been an important area of technology growth and dissemination. Liberalised trade policies have buttressed favourable industrial policies by the state. Industrial policies and state support have not always translated into credible outcomes in the tech sector.[42] Hence, trade has played an important role in building and supporting global technology ecosystems. With improved trade, diplomacy is a by-product ensuring that there is increased accessibility to technology across markets.[43]

India will benefit immensely from spearheading a liberalised technology trade regime. Not only will this provide the domestic sector increased access to global technology goods and services, but it will also build strategic trading partnerships. Technology trade has become an important component of recent diplomatic engagements, and India should look to advocate for the free movement of technology goods, labour and capital across borders. The strategic implications for India leading the talks on technology trade can help the state build trading blocs for the sharing of critical technologies among themselves. Diplomacy through technology trade can help the Indian state in the export of its technology goods and services. It can also position the country as a power open to sharing its advancements in critical and emerging technologies.

India should also build a robust, transparent technology-sharing framework related to high-tech sectors. A grievance redressal mechanism can be put in place when there might be an infringement of IP rights related to technology transfer agreements. In this case, other technological powers will be more receptive to sharing crucial information on specific technologies knowing that there is a safety net in place. In this way, technology-related diplomatic engagements will increase as well as improve India's accessibility to key technologies.

The recently signed India-Europe Trade and Technology Council (TTC) Agreement offers an opportunity for the Indian state to showcase its intent to engage in the trade of technology-related goods and products. Removal of existing barriers such as export controls and import tariffs on technology-related products and components as a result of

the deal can help India establish better diplomatic ties with the European Union (EU) and create a common market for dealing in technology goods and services.

The techplomacy strategies can only succeed when there is a push within the government and specifically the Ministry of External Affairs, to make technology a key diplomatic plank. A primary objective would be to have a Foreign Service officer within the government who can serve as the state's official 'tech diplomat'. The position of Tech Ambassador within Denmark's Ministry of Foreign Affairs and the UK Consul General, who serves as a Technology Envoy, are specifically given the responsibilities of technology outreach.[44] France's position of Digital Ambassador handles all international technology cooperation and diplomatic engagements as a representative of the state.[45] The government of Australia appointed its first-ever Ambassador for Cyber Affairs and Critical Technology in 2021. This was to reflect and assess the central role of technology in geopolitical issues.

These are some templates that the Indian state can follow and curate a position specifically within the Indian Foreign Service (IFS) to handle technology negotiations for advancing India's national goals and interests.

The role of existing Science and Tech (S&T) Counsellors under the Science Wings programme at embassies in Berlin, Tokyo, Moscow and Washington DC can be expanded to include technology outreach in focusing on strategic cooperation, military applications and governance frameworks related to emerging and strategic technologies. The number of these counsellors should be increased and provided adequate technical knowledge or expertise to understand the geopolitical and geoeconomic aspects of certain technologies. This can help increase engagement as well as ensure India drives forward conversations on technology-related foreign policies.

Official government recognition and policy push for technology diplomacy will serve as the first step in India's approach. Once there is traction from the state, the framework proposed above can serve as the guiding principles and strategies for India to adopt in using technology as a diplomatic tool.

V. Conclusion

As the world transitions into the third decade of the 21st century, technology has become more critical than ever. With new applications of technologies coming up ever so frequently, the economic and strategic consequences that technology possesses remain immense.

As a rising technological power, India can effectively use its growth and development in the field to translate it into a diplomatic tool. In an age where technology is influencing a majority of a person's and a state's decision-making abilities, it is imperative that the Indian state understands how technology can impact its foreign policy decisions. In that context, diplomatic endeavours using technology remain the best bet for the Indian state to get new alliance partners, improve its technological footprint across different regions, develop its own domestic private sector and play a role in stymying China's technological dominance.

A holistic framework for utilising technology as a diplomatic plank by the Indian state rests on the three principles mentioned: Building on areas of India's technology strengths; Advocating multilateralism as a necessity for technology cooperation, and Deriving lessons from China and its use of technology as a foreign policy tool. But strategies under these principles can work only with a policy push and increased recognition by the administration, which remains the need of the hour.

TAKSHASHILA
INSTITUTION

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