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TECHNOLOGICAL SOVEREIGNTY & INDIA

A Paper by Working Group of SPMRF

MAIN RECCOMENDATIONS

- » Promote domestic industrial IP by rationalising purchase of global technologies
- » Protect data, privacy and digital domains with national controls
- » Participate in global efforts on tech standards to counter digital colonization

We are in a world where technologies like AI, connected devices of 3D printing, automation, Internet of things and drones have become fundamental to all spheres of activity. Together their form the elements of the fourth industrial revolution. Any country that does not use these technologies to create its own platforms and solutions will remain beholden to external powers. Being atmanirbhar in technology is a critical part of protecting our economic security.

India must rapidly enhance its investments and efforts to create capabilities in several spheres.

The key assertions made in the paper about Enhancing self-reliance by encouraging domestic enterprise; Creating and owning intellectual property; and Investing in secure digital infrastructure.

From hardware for mobile phone communications to defence manufacturing. From payment gateways to power generation equipment. In each of these sectors, India must improve its atmanirbharta.



In India, four broad issues arise regarding technological sovereignty.

1. Creating a market for domestic industrial IP
2. Innovation and national security
3. Governance of digital markets (empowerment and privacy)
4. Self-reliance in tech for SDGs.

Tech sovereignty is about having national control over the technology. Standards have turned out to be a major stumbling block in the quest for technological sovereignty. Given that India, as of now, appears to have limited presence at the global forums on international digital standards.

India needs to view the strategies for breaking into the technology hegemony of the west and of China. It is technology and innovation that are the drivers of economic growth. It is technology and innovation that led to India's domination in a large part of the previous two millennia. And regaining leadership in technology and innovation, breaking away from Digital Colonization, would lead to India regaining its preeminence among global economies and bring prosperity to its people.

An important aspect of technology is its deployment to mitigate the impact of growth on environment. As the focus on climate change increases, India must take control of important technologies to ensure its sovereignty on ecological matters.

India does not have to be protectionist. But it must protect itself against overdependence on foreign owned technological systems: digital or physical. Government and private sector must collaborate to create and consume domestically created technologies.

Introduction

Globally, different countries are coming to terms with the concept of tech sovereignty. Various regions and countries are defining it with the context of their own abilities and frailties.

The definition and scope can range from digital and engineering sectors to pharmaceuticals and defence production. Embedded in all this are urgent needs for security. Today security is as much about cyber protection as the defence of our political borders. Economic, technological, environmental and health security are important dimensions of diplomatic efforts at bilateral and multilateral dialogues.

The key challenge for countries is to manage the fine balance between protection and protectionism.

Countries are striving to protect themselves while ensuring that they do not slip into protectionist tendencies which would hurt their global standing and leave their economy playing catch up with the world.

The term was popularised in European Union while discussing the regulations which would govern personal information in the digital world. This led to the creation of the General Data Protection Regulation (GDPR) Rules of European Union which are now being recognised and emulated in other regions.

Since then the term tech sovereignty has been interpreted to include other sectors where countries feel intimidated by foreign presence or perceive overwhelming dependence on imports.

Even issues of tax avoidance by global giants are being discussed in the context of economic and tech security.

US has defined its tech sovereignty largely around the security considerations around 5G telecom services. It has since moved to include dependence on China for pharmaceuticals as part of debate. The genesis of the trade war was to protect US industries from China to reinforce economic security. Embedded in the theme are the fears of China trouncing the US on technological capabilities.

India has been impacted in many sectors especially regarding China. Open market priorities led India to develop dependencies in critical sectors like pharmaceuticals and non-critical sectors like toy manufacturing. It didn't help that domestic industrial policies remained archaic, stifling entrepreneurial spirit. Small and medium unit, the backbone of the industry, remain stuck with outdated technologies, bound by excessive licenses, deprived of talent and starved of funds.

Post-China conflict, despite interconnectedness with the global economy, India must focus on its manufacturing technology. We need to recast our engagement with the world in a manner that is beneficial for us. India can't be competitive in every area, but it can develop and boost capability to minimise

external dependencies. In fact, India needs to have the world dependent on its own manufacturing innovation in the long run.

The urgent and immediate example is the pharmaceuticals sector. An estimated 60-80% of ingredients for most pharmaceutical ingredients are still imported from China. The slide began over 15 years ago when we allowed our manufacturing to wither away while imports increased.

The questions to address in our paper are about improving domestic capabilities and innovation and reducing external dependencies while increasing global dependence on India. This does not imply closed borders or reduction in global trade because with its large population base it is a great producer and consumer.

This implies improving the efforts to enable manufacturing, creating a competitive market for domestically developed technologies and collaboration with global leaders.

If India aims to become self-reliant in medicines, the government needs to play an important role in facilitating indigenous industry. An important dimension of tech sovereignty is enhancing domestic research, encouraging innovation and development across sectors.

While India has lagged in domestic R&D despite some fiscal incentives, the fact remains that the market does not appreciate or acquire local products. For a complex set of reasons, government departments and large enterprises prefer

to import capital goods and engineering products. Even project development capabilities are imported while domestic capacity suffers.

The Indian government needs to decrease its reliance on foreign products and instead focus on developing indigenous alternative with emphasis on quality and reliability over cost. The obsession of buying international brands needs a change of mindset which will happen if the quality and durability can be addressed along.

We need to focus on investing and developing indigenous capabilities – means more funding for research at universities etc. Branding and other support for small and medium enterprises should be considered with the view that they can become recognised global brands. Indian firms need to compete globally and not just domestically. Quality at no point should be compromised.

Why should Indian organisations make efforts in R&D if buyers prefer imports? Procurement policy and tech should be improved to encourage domestic R&D. At a time when the govt will be the biggest buyer, can procurement tech help Indian companies compete on a level playing field.

Simultaneously, Indian industry must strive for global leadership with best practices and standards. Credit to industry is not adequate. Structural issues and deepening of capital markets would need to be addressed so that novel instruments to finance innovation can be developed. Procurement policies

need to be devised keeping innovation in mind many rules may be archaic and need to be revisited to be better aligned with an innovation driven economy.

Many of India's tendering documents for private and public sector have been created to fail Indian companies and benefit foreign companies. A strong lobby of interests finds it easier to import rather than encourage competitive options within the country.

Government's tendering documents should be revisited to make them a level playing field for domestic and foreign companies. Today we have many MNC R&D centres here in India that are working in sectors which India does not have a presence on the global stage. We need to see how best to generate spill overs to domestic entities. This can be achieved by ensuring our SMEs and universities can benefit through collaborations with these Research centres.

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7. Governance of digital markets (empowerment and privacy)
8. Self-reliance in tech for SDGs.

The definition and objectives of Tech Sovereignty for India would be a synthesis of these four elements.

Giving clarity and continuity to industries is essential.

While promoting domestic defence production, a long-term commitment would allow Indian companies to invest in creating military-industry complexes. For example, On Sunday 9 August 2020, the Central Government decided to impose restrictions on import of 101 weapons and military platforms and creation of a separate budget for ‘domestic capital procurement’.

Steps like these could become the beacon for creating self-reliance and tech sovereignty.

Creating a market for domestic industrial IP

Biases in government procurement

Conversations with large domestic industrial giants reveal how public sector procurement is biased against homegrown suppliers.

In instances where the quality of foreign and domestic vendors is largely comparable, there is much anecdotal evidence that government agencies prefer imports to local purchases. Some of it is embedded in the tender processes for historical reasons. Some of it seems to have been done at the instance of import lobbies.

A few examples can illustrate the situation.

State and central procurement processes and PSUs tend to have rules which militate against domestic sources. Central

PSU Engineers India Ltd specifications continue to ask for product and duty specific proven track record (PTR) in a manner that restricts bidders. For example, if EIL needed a pump with capacity of 80litres / second, then the tender document will seek PTR only for that category. An Indian company which has PTR of pumps with 50l/sec or 100l/sec will not be considered.

The perception is that such restrictive measures are done to favour a few foreign sellers. Ideally such a tender document should mention a range for the capacity. IT can seek PTR of 50 l/sec to 100 l/sec, for instance. This will enable more players to bid and remove perceptions of “gamed” tenders. Similar tenders in US or EU are not restrictive.

Another approach which can create a market for domestic innovation without compromising on quality is fixed term agreements. Indian government entities should offer can consider long term contract for high value capital goods. Once a contract is given, the company can invest with a long-term view. US based companies like Boeing and Lockheed Martin receive long term contracts from their government. This enables them to invest in R&D and deliver a profitable product while improving domestic capabilities.

India has not identified any such segments where it prefers domestic supply. Consider this example. For the new power generating nuclear power plants (NPCIL) KBL was asked to develop certain pumps. The government had a foreign option but said it wants an Indian product because they weren't

certain the German government will ensure supply owing to possible nuclear restrictions. NPCIL requested KBL to develop the special pumps and wanted the technology to be placed in escrow. Germany declined to accede to this condition.

NPCIL placed an order of 24 pumps very high value and complexity which would be delivered over four years. However, NPCIL took 8 months to place the order but KBL developed the pumps within three months since it has started work in advance.

However, NPCIL ended up placing the order for 16 units with Germany while accusing KBL of delays. After KBL had planned and invested for 24 pumps, it could not sell since the final order from NPCIL was too small to be feasible.

This example reinforces the perception that government companies are forced to disqualify Indian firms in opaque manner.

While government entities in India discriminate against Indian companies, other countries favour their own. Some even block Indian companies from bidding with explicit conditions. Many oil companies worldwide place a rule in the tender document which bars Indian and Chinese companies from bidding. There are government contracts in Thailand and Indonesia saying that only G7 bidders are allowed.

Effectively, an India company is locked out the domestic market and squeezed out of the global market too. Indian companies then fight for low value orders or component

suppliers with reduced profitability. As a result, there is little incentive for Indian firms to invest in better technology. This further reduces their competitiveness. In the end the companies get locked into a vicious cycle of stagnant growth.

To improve capabilities, India can learn from global examples. Investment in R&D is a factor of people trained for industrial activities. Thankfully the New Education Policy has laid a lot of emphasis on vocational training and this should address talent quality in India. In Saudi Arabia for instance, no domestic companies can be 20% more expensive as global companies for government tenders.

There are other examples where Indian enterprises are at a disadvantage not just abroad but within their own country.

While India is allowing electric buses from China, the same is not reciprocated. Some RFPs in China have restrictions specifically on manufacturers from overseas including Hong Kong and they cannot bid for eBus requirements in Mainland China. Indian made buses are not welcome in many countries in Europe as well. Often quality and standards are touted as the barrier.

The focus on foreign made systems is so deeply embedded that often tenders mention a foreign supplier by name. An RFP which came out for the Indian Army's Logistics Management System had mentioned the name of a Europe based tech company. European governments though will prefer their own tech companies when announcing global tenders.

The government in India has begun to recognize the importance of developing and supporting its own technologies. The Empowered Technology Group created by Prime Minister Narendra Modi is a crucial step in deepening domestic abilities. The Technology Group will :-

- a. render the best possible advice on technology to be developed for a technology supplier and the technology procurement strategy;
- b. develop in-house expertise in aspects of policy and use of emerging technologies; and
- c. ensure sustainability of public sector technology developed/being developed at PSUs, national labs and research organisations.

An important article co-authored by Janak Nabar, CEO, CTIER in EPW, mentions the priorities for the group. “The five important problems in the technology arena the group is supposed to address are: (i) silo-centric approaches to the development of technology; (ii) technology standards either not developed or applied, leading to suboptimal industrial development; (iii) dual-use technologies not being optimally commercialised; (iv) R&D programmes not aligned to efforts of technology development; and (v) mapping of technologies important for applications in society and industry.”

Innovation and national security

Tech sovereignty is more than the feeling of intimidation, as has been pointed out in several papers^{1,2}. Tech sovereignty is about having national control over the technology. As an example, when India was trying to defend its territories in the mountains of Kargil, from military attack by adversaries, Indian military was denied the usage of the mapping technologies that it had bought during peace time. Apparently, the fine print said that the mapping technologies cannot be used during conflict. This was a perfect example of violation of tech sovereignty, where the national government did not have control over the technologies that are critical for the nation. This experience led to India developing its own constellation of geo-positioning satellites, the NAVIC system.

Sovereignty is one of the cornerstones for ensuring the security of the country and ensures that India as a nation can stand up to pressures from other nations. Sovereignty is critical to ensure our economic independence.

As India strives to maintain a competitive IT industry landscape, the ability of the ICT industry to provide the

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1. Jaijit Bhattacharya, “Strategic Implications of Internet Governance”, in CLAWS Journal, Winter 2013
 2. Jaijit Bhattacharya, “Imperatives For Technological Sovereignty For A Credible Indian Defence Ecosystem”, in SALUTE, October 2015

requisite technologies reliably for civilian requirements and for military requirements, needs to be significantly enhanced. The issue is compounded with the fact that India has limited presence at the high-stake tables of Digital standards.

Standards has turned out to be a major stumbling block in the quest for technological sovereignty. Given that India, as of now, appears to have limited presence at the global forums on international digital standards, we appear to be abdicating our responsibility to secure our IT and digital industry as well as IT usage. This situation has very deep implications on our economy and our defence preparedness.

With the lack of control over the technological layers, Indian economy and defence institutions will be challenged to protect the nation from Cyberwarfare.

More importantly, military hardware itself could be subject to intrusions and control by adversaries, thanks to the increased “intelligence” of the equipment.

Given that tactical initiatives on the ground need to be backed up with complex supply chain which are increasingly dependent on critical information infrastructure such as Railways Signalling, telecommunications network etc, the entire economy and military strategy could be threatened by compromising the critical information infrastructure which has non-authenticated ICT components.

With the same “ICT intrusions”, the Financial Infrastructure of the country can be brought down, impacting the ability of

the military to sustain a conventional warfare. The impact on Network Centric Warfare is also obvious.

Thus, it is imperative that we move towards digital ecosystem which provides greater control over the digital infrastructure.

More importantly, imagine the impact on the economy in general, and the defence logistics in particular, if the “.in” Top Level Domain (TLD) is deleted from the Internet root servers. Such a move would cripple the economy and severely restrict the ability of the Indian defence forces to respond to a strategic situation. It would be worthwhile to mention at this stage that India has minimal control, if not no control, over the root servers. In other words, India has no technological sovereignty over the theatre where cyber warfare gets played out. Thus, an obvious way forward for India as a nation is to build the ecosystem of technological sovereignty which will strengthen its capability.

There is also an increased threat to Technological Sovereignty from Digital Monopolies that control vast amounts of data pertaining to the country, the citizens and the businesses. It is important to address the threat to Technological Sovereignty from Digital Monopolies. This is especially true of Digital Utilities that are widespread, are ubiquitously used and that benefit from network effect and hence become natural monopolies. Since these Digital Utilities operate in an over-the-top manner, where they ride on regulated utilities but the apps themselves are unregulated, they pose a significant

threat to India's security and internal law and order. Digital monopolies that originate from nations that pose themselves in an adversarial manner to India's interests are especially worrisome.

Among the top 20 apps used in India, one can easily identify TikTok, Likee, UC Browser, Helo, VMate and ShareIT as apps that are present in most phones in India and that could easily be used to create inimical situations for India.

The impact of policies, regulatory frameworks and standards on technology sovereignty is critical for the growth of the Digital economy as well as the larger economy linked to the digital economy. Digital Economy permeates into all aspects of a modern society, from agriculture to education to health and industry. Therefore, it is imperative to have an appropriate policy framework for technology sovereignty, especially for the Digital Economy. India would need to gain technologies that are not necessarily Frontier Technologies but are critical from the perspective of Technological Sovereignty.

The other side of Tech Sovereignty is Digital Colonization. A 2010 research paper that published by Dr Jaijit Bhattacharya, President Center for Digital Economic Policy Research (CDEP) had formally proposed the definition of Colonization as the extraction of disproportionate economic benefit from an area of influence through either manipulation of the rules of engagement or through force or deceit. Dr Bhattacharya had identified three kinds of colonization, starting with Social

Colonization, then Politico-military colonization and now, Digital or Technological Colonization.

It is important to understand the term that that was coined more than a decade ago, so that we as a nation are better prepared to respond to the challenge. To begin with, it is important to understand what Colonization from an economic perspective is. In fact, the drivers of colonization have always been economic, and hence any other definition of colonization is superfluous. The dictionary definition of colonization is the action or process of settling among and establishing control over the indigenous people of an area. But that is not really what happened to nations across Asia, Africa and Americas. What happened in these areas from the 18th century till late 20th century, was a massive extraction of wealth by a few, at an inhuman cost to many.

So, what is Social Colonization? Social Colonization is what happened in most societies where a small section of the upper class of the society, wielded enormous power over the rest of the society, and subjugated them, leading to disproportionate economic benefit to the few who controlled the society. This led to serfdom in Europe and Russia with the aristocrats getting the benefit of such an economic structure at the cost of the vast majority. This was colonization of the masses within the country. There were similar structures in Asia and other places also.

Something then happened towards the latter half of the 18th century – the French revolution of 1789. The revolution led to dismantling of the “social colonization” structure in France and the message spread fast in Europe that the days of rampant Social Colonization was. However, how would the class that was benefitting from Social Colonization continue to maintain their opulent lifestyle if they did not get to extract disproportionate economic benefits from their population, who used to toil hard to keep these few aristocrats rich? This class very quickly gravitated to shift from the exploitation of their population to the exploitation of populations of other lands where they were beginning to taste military wins. This was the beginning of politico-military colonization in an institutionalized manner.

Since the colonial powers established full control over foreign lands and their population, establishing the rules of engagement through force and deceit, that lead to massive economic exploitation. None of these rules were in consultation with the locals. The rules were not even part of any treaties.

For example, In India, the British laid out a rule called the Doctrine of Lapse that prevented an adopted child from claiming the throne, that led to the famous war with the Rani of Jhansi. But why would anyone be forced to follow a doctrine that was unilaterally adopted by the British? Similar principles of laying out a “rule of law” but the law being twisted to favour of the colonial powers, was followed in the economic sphere,

and continues to be a hallmark of the modern era. The earliest imposition of such laws in the economic sphere was for the textile industry where in the late 18th century, the British imposed heavy taxes on exports from India, after they failed to stop the consumer demand for the textiles in Britain. It broke the back of the textile industry in India, which at that time accounted for over 25% of global textile production. In tandem, poor quality textiles were forced onto the Indian market, thus depriving the Indian textile manufacturers from accessing their own market. This economic measure sent millions of weavers to starvation and death.

That was the era of politico-military colonization from which, countries like India were liberated from the 1945 onwards. During this period of colonization, the Nobel Laureate, Rabindranath Tagore wrote a poem which goes something like “Where the mind is without fear and the head is held high, and where Knowledge is free... where the mind is led forward by thee into ever widening thought and action, into that heaven of freedom, my father, let my country awake”. What is the significance of these lines in the context of colonization? It was clear during the writing of this poem that only political liberation is not enough. It is important to have free, unhindered access to knowledge, which translates to technology, in order to be truly liberated.

However, very soon, by the 1960’s, we saw the phenomenon of tremendous push by the western nations, on the issue of

Intellectual Property Rights (IPR). Professors were exported from the US and other western nations to “teach” the merits of IPR. Patents were fiercely started to be imposed through trans-border regulations, undermining sovereignty of nations with impunity. Why did this change happen in the 1960’s?

The last of the major colonies got independent in the 1960’s. This would have had a major impact on the rich who were at the top of the pyramid of world order. The rich in the west (and the west had become very rich by then, by the wealth accumulated from the colonies or from slave labour), had to figure out another mechanism to continue to maintain a way to extract disproportionate economic benefit from the erstwhile colonies and the rest of the world. This is where IPR fitted in very neatly. Since the plunder of the colonies was not limited to economic plunder but also intellectual plunder, knowledge and technology had moved to the west.

Technologies such as extraction of Zinc, moved out from India to China and Europe in around the 17th century, and got patented in Europe. So, what the west had to do was to construct a monopoly over this knowledge base, in order to further their economic interest. This monopoly was constructed over the back of trans-border regulations on IPR that included patents, TRIPS, Information Technology Agreement (ITA-I and ITA-II) and other myriad structures which were introduced as the new “rules of engagement”.

What was worse, was that the world was held hostage to a



vicious cycle of western companies creating new technologies, introducing standards around those technologies through global bodies such as IEEE, IEC etc, earning monopoly rent, which would then be plowed back into creating the next generation technology, which would promptly declare the previous technology to be outdated (remember how your fully functional laptops are junked and you are forced to buy new ones, which does exactly what your old laptops were doing), thus preventing any new players from coming in.

The technology is controlled through an ecosystem that would not allow new entrants from the non-western world,

except for Israel. Any technology, created anywhere in the world, has a tendency of being sucked back into the ecosystem of the west. This is like the barriers of trade that were erected for the Indian textile industry in the late 18th century. This is the basis of “Digital Colonization”, where the standards, the technologies and the trade structures supporting the monopoly to technology, are controlled by the west, perpetrating disproportionate extraction of economic benefits from the rest of the world.

And what has such rules and structure of technology barriers to trade translated to? It translated to a situation where disproportionate economic benefits continued to flow to the west, until China stepped in like a bull in a proverbial China shop, ripping apart any respect for IPR, copyright, patents etc., and challenging the technology hegemony of the west. The challenge is visible from core technology, electronics, biotechnology, genetics (including genetic manipulation of viruses), to apps in the phone. We see the trade structures that promoted western hegemony on technology, are now beginning to be leveraged by China.

As a corollary, we also see the west now coming down heavily on China, to safeguard their hegemony on technology. Taiwan has become not just a geo-political issue but an important outpost for maintaining the structures of Digital Colonization as bulk of the global semiconductors are manufactured in Taiwan, using US technology. If freedom of people was the

key driver of US intervention into defending Taiwan, then they would have intervened into Tibet also, 70 years ago.

It is in the above context that India needs to view the strategies for breaking into the technology hegemony of the west and of China. It is technology and innovation that are the drivers of economic growth. It is technology and innovation that led to India's domination in a large part of the previous two millenniums. And regaining leadership in technology and innovation, breaking away from Digital Colonization, would lead to India regaining its preeminence among global economies and bring prosperity to its people.

Governance and privacy in digital markets

It is basic rule of business. The larger the client, the better it is treated. Companies and sales take special care of their loyal and large clients. Simply because such clients bring continuity, consistency and profitability. However, in the case of digital giants and India, the relationship is nothing like this.

Step back and think about it. India is the world's largest free market democracy which is open to everyone else.

India has emerged the largest open digital market in the world with hundreds of millions who are active users. Average data consumption by India consumers is likely to double to 25 GB per month per user by 2025, according to the Mobility Report by Ericsson. Most of the access to the internet will be through phones though residential areas are witnessing a 20-100% hike

in data usage. India has the highest data consumption per user in the world. India will continue to be the leading consumer of data with over 410 million smartphone users likely to be added by 2025.

Data use means, that Indians spend time and money on digital activity. From social media to shopping. From paying taxes to availing government services, Indians are far ahead of many developed countries in depth and breadth of digital activity.

Such a country is the ideal market for global digital giants like Google, Amazon, Twitter, Apple, Microsoft and Facebook.

Remember also that most of these companies are not allowed in China. The firewall by the government prevents such companies to access to Chinese consumers.

So, in an ideal world they should take extra care and offer special attention to India. While much of it is opaque, here is some of them earn from India. Facebook and Google earned at least \$1.6 billion from India in 2018-19. The numbers are increasing steadily. Amazon's earnings are estimated to be \$1.9 billion from India.

And here is how they behave in India.

They don't want to pay taxes.

They don't respect India's sovereignty

They crush competition.

They demand exorbitant, exploitative fees

They don't respect data privacy.

Amazon is not cooperating with a Parliamentary committee debating data privacy laws. Twitter allows Jammu & Kashmir to be shown as part of China in tweet location. When questioned, they didn't apologise but termed it a technical error. Even when Twitter is not allowed in there, it seems to be more fearful of China than India.

Google wants to take 30% of the revenue of Indian apps on its PlayStore platform. Effectively crushing the profitability and growth of domestic tech applications.

These and many other examples point to an arrogance that display a colonial mentality. They have been allowed this arrogance so far.

The anger displayed by the Parliamentary Committee against Amazon is a good sign of change. So is the case against Google at Competition Commission. Twitter and Facebook are being sharply questioned for playing with freedom of expression by censoring some and promoting other political views.

It is time that India stood up their bullying behavior. They must understand a simple fact. They need India more than India needs them. They can't hire a few thousand in India and expect the rest of the 1.3 billion people to be grateful for it.

If India were to behave like China and stop their access, these giants would be in trouble. The recent ban on Chinese apps has shown that Indian entrepreneurs can create equally good if not better options for our consumers.

India must force these giants to change their behavior. India

can speak from a position of strength and not weakness.

Already, some companies have approached the government to create an alternative to Google's PlayStore and Apple's AppStore which together monopolize the market. A domestic app market which is open and supportive would offer terrific competition to these companies.

India's domestic industry, civil society and policy makers must tame global companies. If they want to thrive in India, they must follow our rules. Even the government of US is forcing them to stop their anti-competition behavior.

The irony is that companies like could grow when US government and anti-trust laws forced then dominant Microsoft to allow the google search engine to be loaded on computers.

Not just companies from Silicon Valley or Europe, India must be vigilant against China too. India is a biggest global market for China as well. After the ban on Chinese apps, continuous attempts are being made to circumvent the ban. Chinese apps are trying to change their name and brand to continue to lure Indian consumers. Center for Digital Economic Policy Research (CDEP) discovered and alerted the Ministry of Electronics and Information Technology about one such case. The Ministry had banned China's Kwai app. But Kwai rebranded itself as Snack Video and is freely available in India. Snack Video is operated by Symphony Tech Pte Ltd, which is owned by Beijing Kuaishou Technology — owner of the Kwai app, says CDEP. The government must investigate other such

attempts by the Chinese to circumvent the ban.

It is time for India to behave as a large important market. Global companies will have to listen to the market that is India and follow its rules. These companies can't be allowed to dominate or dictate to the Indian market. India should not shy away from imposing reasonable limits and rules on global giants.

Protection and security of personal data of Indians should remain non-negotiable. Global giants should be made to follow rules that benefit India.

Tech for SDGs

An important aspect of technology is its deployment to mitigate the impact of growth on environment. As the focus on climate change increases, India must take control of important technologies to ensure its sovereignty on ecological matters.

The critical role of the Fourth Industrial Revolution technologies

The 4IR technologies will have an important role, either as a critical driver or supporting function, for over 80% of the business opportunities identified by 2030, representing nearly \$8.7 trillion in value. Clean technology is on a massive upswing.

As the cost of building new solar and wind continues to fall, the world has perhaps already reached a “coal crossover”

point. In 2019, 75% of US coal-plants were more expensive to run than new renewables. The USA got more energy from renewables than coal for the first time. The forecast for oil is that there will be more oil left in the fields than what will be pumped hereafter. The major shift in mobility technology is a significant contributor to this consequence.

Industry-specific opportunities

There are industry-specific opportunities in three (3) critical economic subsystems, by 15 possible transition areas. Some of these are primary/ direct impact, while others are an enabling impact. Let me give an example each for each 1 of the critical subsystem areas.

A. Food & Ocean Use – regenerative ocean farming

Farming seaweeds and shellfish in less than 5% of our oceans could absorb 10 million tonnes of nitrogen and 135 million tonnes of carbon, all with no freshwater or other inputs. For every 1% of the world's ocean, this could create 50 million jobs and produce significant amounts of food and non-food products. Non-food grade seaweed can be used as a plastic substitute. We could deploy a Regenerative Reef model that includes the whole supply chain, from low-impact ocean farms to end-buyers. This vertical polyculture farming system can grow a mix of seaweeds and shellfish that requires zero input, produce high yields over a small area, sequester carbon, and rebuild critical reef ecosystems.

B. Infrastructure – the impact of the falling urban density across regions

The space occupied by urban areas is growing faster than the urban population. Globally, 60% of all urban space is sparsely populated. In the US, 15% of urban land is vacant. Low-density cities with high rates of car usage increases cost by 30%. Traffic jams due to poor land-mobility planning can lower national GDP by up to 5% by time loss, wasted fuel and air pollution.

Globally, an estimated 40 billion square metres of floor space, about the size of Switzerland, is not used at full occupancy during office hours. With COVID, it will be even more. COVID has prompted a surge in remote working and out-of-school education models.

Residential underutilisation is also high. Most middle-class homes in the world have at least two (2) spare bedrooms. Research shows that by better planning and utilising vacant inner-city land and by promoting compact urban growth, we can reduce land use by as much as 75% in the cities.

This reuse of available urban space can also be used for vertical food-crop farming whereby citizens can access fresher food, faster and cheaper, right around their neighbourhood. In Europe, this can reduce an area equivalent to the size of Belgium by 2050.

More-compact urban development yields a wide range of benefits, including productivity gains and reduced health

impacts, thanks to lower air pollution and fewer traffic accidents. It can also save up to 50% of upfront capital expenditure on new infrastructures by sweating existing assets such as roads, sewerage, and water lines. We can cut our infrastructure development cost by \$3 trillion till 2030 globally.

C. Minerals and extractives – recycling practiced by automotive companies

Jaguar Land Rover (JLR) first began their aluminium recycling effort in 2013. Till 2019, JLR collected and reused around 300,000 tonnes of aluminium, and incorporated repurposed parts into every model. This action resulted in an overall 46% drop in carbon emissions in production. The next phase in JLR's aluminium recycling programme is designed to retire large fleets of vehicles. It will harvest aluminium from old cars for use in alloys for new vehicles.

The world of government and business

Achieving a nature-positive economy requires business actions, policy, and regulation from governments. But it also needs shifts in habits and social norms from citizens that will need persistent advocacy at all levels to generate awareness in our society.

Funds are being allocated to support innovative start-ups addressing issues like green energy, sustainable water & food technology, but also of livelihood & gender inequality, child

development. Europe is leading the way here. Even in term of government's COVID recovery packages, many countries are affirmatively supporting investments in alternative nature-positives.

Businesses are also deploying their money where the mouth is. They are dramatically accelerating the transition to a nature-positive economy. They must collaborate better on the advocacy, design and adoption of the policy reforms, to protect, restore, and sustainably manage nature.

The green technology and sustainability market are projected to multiply, even with COVID, at about a 27% CAGR. This growth will be one of the highest in any markets. Most of WEF's top 10 most promising technologies have a clear environmental and social focus: energy-efficient water purification, enhanced nutrition to drive health, precise drug delivery, nanotech engineering, organic electronics, and photovoltaics.

Indian enterprises must invest in the green opportunities even as government must try to create an enabling and encouraging policy framework. India can't be dependent on foreign sources alone for green tech solutions.

CONCLUSION

There is little doubt that India must strengthen its governance systems. Aggressive policy-led promotion of domestically created technology is critical for India's economic security.

The Empowered Group on Technology must interpret its recommendations and actions with the prism of sovereignty. Other important steps are being taken to improve domestic capabilities. "The newly created Indian National Space Promotion and Authorization Centre (IN-SPACe) will provide a level playing field for private companies to use Indian space infrastructure. It will also hand-hold, promote and guide the private industries in space activities through encouraging policies and a friendly regulatory environment," says an official statement from the government.

A government owned body New Space India Limited will catalyse the collaboration by seeking the needs of the private sector.

ISRO can focus on research and development which requires long term committed funding which private sector does not have. While private players can innovate to create new applications and business models using space tech. Currently there are about 300 private companies which work with ISRO as suppliers and vendors. Some of them can build on their experience for new products and services. Some start-ups have declared their plans for launching private satellites. Promotion of space technology

companies will enhance tech sovereignty.

Government has decided to set up data centre parks and a National Mission on Quantum Technologies and Applications with a fund of Rs 80 billion for a 5-year project. “Quantum technology is opening up new frontiers in computing, communications, cyber security with wide-spread applications. It is expected that lots of commercial applications would emerge from theoretical constructs which are developing in this area,” the Finance Minister announced. The government has also provided a much needed Rs 60 billion boost to provide rural regions with Bharat Net fibre-to-home connectivity.

All such initiatives will deliver their full impact once India becomes the consumer of its own creation. Domestically created software and industrial products must get a preference in India. The biases against domestic products should be removed from Government procurement policies so that Indian products can compete on a level playing field at least.

India does not have to be protectionist. It must protect itself against overdependence on foreign owned technological systems: digital or physical. Government and private sector must collaborate to create and consume domestically created technologies.

It is hoped that this paper will trigger a deeper effort of action, research and policy guidance within government, industry and academic ecosystems to strengthen India’s technological sovereignty.

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