Bold Seismic Technology Transformation Begets Aatmanirbharta

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"If Data is the New Oil, Technology is the New Oil Refinery....Let us create the New Eco System"

"Whatever can be Precisely Defined can be Perfectly Designed and Developed"

—The Mantras of Era of Disruption

Introduction

The 451 MoUs signed over a period of three days of Defence Expo 2022, worth over INR 1,50,000 Crs, is a benchmark never seen before in the 75 Years of India's Independence. A resurgent India on the move, has embarked on a three-front technology sojourn— the *first Front* is the 'Make in India'— a precursor to a consistent 'Made in India' brand technology and equipment; the *second front* is Aatmanirbhar Bharat — a call for self-reliance with adequate technology muscle for indigenous needs and

Key Points

- Aatmanirbhar Bharat is a strategic program for becoming self-reliant in manufacturing and services sector.

- Driven by the 4Ds — Data, Digitisation, Digitalisation Disruption, India is standing on the threshold of transforming into a future global power, having launched digital public infrastructure and eGovernance programs.

- Need to take a long term view in launching the National Technology Framework, National Technology Strategy and Technology Development Program, Technology Policy, National Technology Act to regulate the development and proliferation of technologies through a Government, Public-Private-Academia Partnership.

- Corporate Professional Responsibility Fund, akin to CSR Fund, needs to be created.

export competitiveness, and the *third Front* (have been calling it half front) is the 'Startup India'— to train the agile ignited young minds into entrepreneur ventures—small teams as potential 'unicorns'. All these coming up concurrently has created an enormous technology and innovation bandwidth, and an excitement in India which has tech reverberations worldwide. A Nation known for technical prowess, comprising strategic thinkers and technology wizards, leading technological institutions and industry globally, white collared technology enabled professionals and skilled innovative technical work force at the grass roots— all this under vibrant leadership of the industry coupled with a strong political will, has ushered an era in technology development by giving the world two major game changing concepts — *Jugaad* which means a resourceful approach to problem solving and *Aatmanirbharta* which means self-reliance. These initiatives and more, visibly seen in the just concluded Defence Expo, epitomises that India have created its mark in the technology world.

What has been seen over the past few years of Aatmanirbharta and Make in India (MII) drive, is India's consciousness for self- reliance. The Gati Shakti multifaceted National Master Plan, roll out of 5G, eGovernance initiatives under Digital India, UDAN-RCS, BharatNet, BHIM UPI, Ayushman Bharat and of course UIDAI Aadhar, are some big ticket programs that have given India a technological dominance globally and promoted ease of living domestically. Although, these 'local for global outreach programs' have created ripples globally, but their impact is yet to be felt in the Armed Forces Information and Decision Support System. There are obviously some dots that needs to be connected to create a 'net centric' enabled Armed Forces.

Strategic Taming of Technology
The 'New Technogical World Order' is defined by four Ds viz. Data, Digitisation, Digitalisation and Disruption. While these have fuelled digital transformation globally, giving rise to a large number of dual use technologies which are drivers of automation and autonomous applications, it is 'disruption' which not transformed technology at an unprecedented pace, but also transformed business concepts, models, processes and practices. Hence, while oil is being touted as the 'New Oil', 'Technology is the New Oil

Refinery'. There is a dire need to create an ecosystem that sans technology *confetti* to create an ecosystem for technology development.

The moot questions however includes—as one of the emerging global power centre of technology' how will India attain technological sovereignty? We are ranked as the 17th technologically advanced Nation and third largest military expanding nations globally. How do we leverage our technological might to reverse the rankings, as a first step? How have USA, China, France, Japan, Germany, Russia, Israel, South Korea, Singapore, to name the top few, attained technological advancement? These serves as model for case studies on national vision, mission, methods, strong political will, whole of Nation approach and consistent responsible behavior, driven by purpose and a well- articulated technological strategy, to create home grown solutions and recipes. The challenges and opportunities met by each have been enmeshed constructively in legislations and governance models to exploit R&D and empower the Nations. To name some USPs, USA has the Defense Production Act 1950, China went into 100 years marathon starting in 1949, Israel stood out innovatively as the Startup Nation but all created an ESG ecosystem to gain technological edge as a key determinant of their capacity building and capability development for macro-economic dividends.

Bold Seismic Technology Transformation Planning

Notwithstanding the immense euphoria of the defence industry, space based and other startups showcased in the DefExpo of October 2022, it is a good time for India to think and articulate a focused Technology Strategy for gaining Technological Sovereignty. Globally, it is acknowledged that management art, science and other best practices have emanated from defence – so did internet, the world wide web and NextGen technologies. The reason is simple— armed forces, globally, faces local challenges but not of the dimensions in India wherein there are a wide threat spectrum comprising internal security, low intensity conflict, terrorism, out of area contingencies and a perennial threat of a limited to full scale war – all governed by Volatility, Uncertainty, Complexity and Ambiguity (VUCA) of the present and Brittleness, Anxiousness, Non- linearity and Incomprehensible (BANI) contours as of the emerging scenarios. Add to these, technology driven Disruption and VUCAD today or BANID

tomorrow has the threat perceptions of Grey Zone — hybrid/ invisible war which transcends time and space.

The best model of self-reliance is creation of our own unique model which gives homegrown indigenous solutions. This requires a bold seismic transformation through a well-articulated National Technology Strategy (NTS) – incremental change will not be helpful, given the momentum generated by the 12th Edition of DefExpo and the preparedness of the defence industry. There is a need to put in place a number of focused Programs comprising project structures, policies, systems (Task Team Time), for achieving well defined technology milestones. Some thoughts on plausible key determinants of the NTS are analysed in paras below.

- ***National Technology Framework (NTF).*** The first is to develop a NTF. Many initiatives have been undertaken under the ambit of the National Technology Development Board to create technology innovation hubs and Centres of Excellence (CoE) in identified technologies. Each Ministry comprised few CoEs. There are Technology Innovation Hubs at IITs, Defence Industry Academia CoEs at DRDO, Centres of Excellence (CoEs) being driven by Armed Forces, CoEs of MeiTy, DST, ISRO and a host of others in public and private sectors. These efforts need to be vectored into pre-defined focused technological stacks with minimal overlap for optimum utilisation of funds and human capital. This obviously calls for a cogent National Technology Framework to articulate a strategy titled the 'National Technology Strategy' with a clear technology forecast, technology development action plan with a program (akin to Integrated Guided Missiles Development Program {IGMDP}) / project management time bound deliverable milestones and an end state of each technology vertical. It is an interesting study on how, notwithstanding the Missile Technology Control Regime (MTCR), India redefined industry benchmarks to meet the challenges of technology required for guided missiles, defined as projects in aerodynamic structural materials, propulsion requirements, guidance & control systems and warheads, to name a few. This is an Indian model which needs to be replicated through the National Technology Strategy. This strategy will change the way technology sovereignty progresses. A base line document can be prepared from

the Defence Technology Capability Development Document and similar ones from the Indian Railway and ISRO, to name a few big tickets. Mathematically speaking, a Venn Diagram will give a clear articulation of technologies which are common to most and those which need Service specific focus. These could then redefine contours of CoEs through mergers of common tech stack and acquisition of Service specific tech stack to drive the National Technology effort.

- *Ministry of Technology and Innovation (MTI): MTI.* Implementation of every idea is as good as the strategy itself— organisational structure, program & project management focus and the human resources implementing them. Technology sovereignty would need a stellar structure in the form of the Ministry of Technology and innovation. DST needs to be upgraded to become the Ministry of Technology and Innovation. The Technology Readiness Levels (TRL) from basic research needs (TRL 1 to 3) to product focus (TRL 9) could form part of the Ministerial Department. Today, number of R&D organisation exists within the government and also the private sector, employing subject matter experts (SMEs) and deploying huge amounts of funds on R & D. These resources can be optimised through a four pronged strategy.

  - **National Technology Act (NTA).** Create a NTA legislation and control regime to synergise the efforts of these R & D synergies with the concept of 'One Technology One Program' (OTOP) focus. R and D efforts must become meaningful engagement through agencies complementing rather than competing with each other. As an example, all agencies dealing with quantum computing (QC) needs to be registered under an appropriate vertical under the National Technology Development Board for creating synergies and jointness among SMEs based on the areas of R&D.

  - **Management of Intellectual Property Rights (IPRs).** Maintaining a technological, edge through generating consciousness, to file IPRs in whatever niche design and development is carried out, needs to be perfectly practiced, as a strategy. This will set the stage towards meaningful research with technology outcomes and pave the way to become global leaders in IPRs. This would have a resounding effect on technology proliferation and technology strategy.

- o **Government, Academia, Public, Private Partnership (GAPPP).** Build synergies between academia, public sector, private industry, startups, R & D organisations and government Institutions like CoE, STPI, etc. dealing with technology development where technologies are incubated and churned out as prototype use cases. This would ensure that all hands are on the deck at the right place, at the right time, with the right focus churning technologies with the 'best bang for the buck'. The TRL based spiral ecosystem would prepare grass root TRLs, that will have a rejuvenating effect on the Technology Fabric of Aatmanirbharta.

- o **National Technology Broadcast: 11 May Focus.** Akin to National budget broadcast every year in February, we need to have a technology forecast and development strategy in the month of May every year prior to or on the National Technology Day— 11 May. This will create a national fervour on Technology and attract both the youth and veterans as the two ends of the professional continuum.

- *Inter-Ministerial Technology Synergies: Create Inter-ministerial Synergies.* Technology developed by Space Application Centre, ISRO, can be customised to give the Indian Armed Forces a cogent Battlefield Management System. Obliviously, the above actions need agile structures and policies to enable and implement a tight knit Technology Strategy in India. Number of structures in various Ministries could be revamped to create a focused technological landscape of OTOP. Further, India has a healthy mix of skilled qualified youth and extremely experienced retired fraternity. The youth bulge, which is a demographic dividend and appropriately qualified retired fraternity, can be harnessed through multi-layered initiatives of taming skill development and technologies. These tech focused startups with 'amoeba organisational structures' would help bring in technology development and proliferate niche technologies, in the continuum of time. An inter -ministerial structure like the Niti Aayog could articulate and drive the Technology Strategy of India.

- *Corporate Professional Responsibility (CPR).* After astounding success of CSR Program based on the Companies Act (2013), CPR at 2 % of similar nuances can be ploughed into R&D. Technology development is a painstaking exercise of development Operation cycle comprising define, design, develop, fail and redesign.

In any case, this is the need of the disruptive times – think big, start small, fail fast, recover faster – be first, be agile. This exercise requires huge funds to go through iteration of 'trial and error' bereft with failure cycles in an arduous journey to fruition. There is, therefore, a requirement of large funds to develop and sustain niche disruptive technologies. Government would do well, in the interest of Aatmanirbharta, to institutionalise a fund titled "Corporate Professional Responsibility (CPR) Technology Development Fund" under the Companies Act, 2013, for technology development as a National initiative. This fund, in effect, would be akin to Corporate Social Responsibility (CSR) fund— two percent which Companies deploy based on turn overs and profit margins. The Technology Incubation Centres, Technology hubs, startups need to be funded by CPR based on industrial houses and guided by identified subject matter experts. How else do nations build their technology muscles – let us evolve our model. India was the lead to legislate CSR and has drawn benefits in the social fabric of the Nation. Let us take a peek into development of niche technologies through a budget; business lens and CPR is an idea, the time for which is long overdue.

- ***Consolidation of Demographic Dividend: Harnessing the immense power of Demographic Dividend that we Enjoy as Bharat.*** Aatmanirbharta and Make in India must transcend to 'Made in India' and lead to meaningful value addition to the technology might, sub-assemblies - assemblies - products and production line, exports and economy by dealing with the complete life cycle. Towards this end, the industrial corridors pan India needs to be developed with the thought of Made in India. This calls for redesigning the higher education sector by revamping technology institutions to harness skill development and produce job ready engineers. Job ready would also imply training on project management, quality control, IPR and patents, positive responsible attitudes in addition to aptitudes to compete with global standards by producing quality products. The skill levels need to be certified for enhanced work force effectiveness and create Certified Welding Professional etc. akin to CFPs / CAs. Youth need to be motivated to learn foreign language skills which could be introduced at secondary school levels and beyond for better international impact. This calls for a dynamic "think-act-rethink" deployment of NEP 2020.

- ***Defining and Surpassing Global Standards.*** This relates to defining and surpassing of global manufacturing standards. Japanese embraced the 5S manufacturing principles to define global benchmarks— Seiri (Sort), Seiso (Shine), Seiton (Set), Seiketsu (Standardise), Shitsuki (Sustain). America adopted these and went beyond to create a formidable brand value in defence equipment. India needs to adopt a strict quality regime, driven by technology and innovation to surpass global best standards and thereafter create best practices. This calls for legislation through National Technology Act, National Production Act, stringent quality control and assurance through project management standards to meet global competitiveness. Indian Defence Forces are always ready for combat due to their external and internal security commitments. Hence, the indigenous defence equipment would be 'tried and tested' under extreme operational conditions. Akash Weapon System and Brahmos are the vanguards of Indian export. Hence, to become a global first choice in defence equipment exports, high technology standards, life cycle support and stringent global compliances, will become a compulsion rather than a choice as we embark on 'Made in India' journey. India has created a COVID vaccine pull globally – we need to repeat the dose in other technologies, as well.

- ***The Low Hanging Technology Fruits.***   What if we take the lead in drones which has a global market of over 50 Bn USD in the next five years, renewable energies, EV, ICT hardware and software, software defined networks and allied equipment, emerging technology stacks AI, AR, VR, meta, IoT, Big Data Analytics, Blockchain and chip manufacturing to name a few mega trends. To that extent, a user friendly export policy, both for local producers including MSMEs and global recipients, would need to be redrawn. Industrial corridors must become the key determinants of capability development and capacity building in India. Global competition must look towards Indian manufacturing industry as high quality entity.

- ***India a Womb to Tomb MRO Hub: Mega Maintenance, Repair, Overhaul (MRO) Footprints as a Hub.*** With a huge fillip in the manufacturing sector through industrial corridors with a formidable defence base, life cycle sustenance support of equipment is a huge opportunity. While the procurement costs are the tip of the iceberg, life cycle costs and total cost of ownership are matrices wherein huge cost dividends are hidden (**see Figure 1).** As a thumb rule, cost of equipment, specialised tools, test

equipment, infrastructure for MRO and MRO, spares, training of user and maintenance staff and user cum technical literature, is at least thrice the equipment cost— a latent but realistic opportunity for the Indian industry. The 'womb to tomb life cycle' of an equipment is a resource intensive journey requiring maintenance, repair, overhaul (MRO) of equipment, technology upgrades to beat obsolescence, and end of life management. This is a cost and effort prohibitive exercise. The Indian Armed Forces are past masters at MRO activities of three generations of equipment — legacy 'Gen X&Y', contemporary 'Gen Z 'and state of the art 'Gen Alpha'. Given the youth bulge and the export potential of the 'Made in India' defence equipment, an established MRO life cycle support is a huge opportunity to be harnessed and exploited globally. Hence, India is the land of technology, innovation, *jugaad* — a potential MRO hub.

Figure 1: The Iceberg Effect
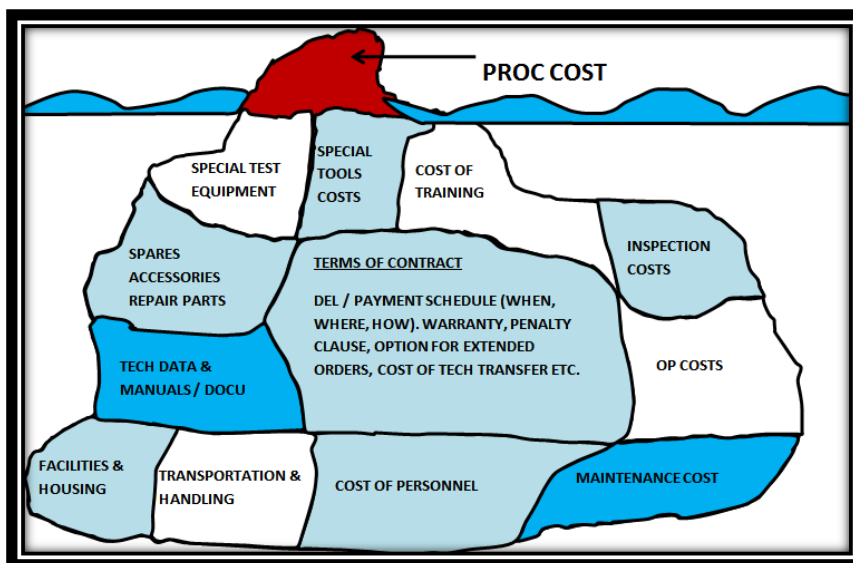
Source: Prepared by the Author

Conclusion

Strong technology leaders beget strong technology base and strong technology base creates technology sovereignty. The New World Order respects nations that possesses the strength to manage VUCAD *India gained a tall global stature through its vaccine diplomacy (Vaccine Maitri) which was developed, produced and transported in a record time.* A stark example of Vaccination Diplomacy through Vaccine Sovereignty. Bewildered and worried by

the struggle of a pre natal butterfly in the coccon, a child opens the cocoon to let the butterfly fly off. Alas, the butterfly fails to fly and died on the spot, since the wings did not develop the intrinsic strength. The struggle to decocoon, afforded by the Nature, in the final developmental moments is the grand strategy to create butterflies – huge technology strategy in all the divine creations. With a good intent but inadequate knowledge of hows, whys, whats and what ifs of the child, a potential creation was dead.

Aatmanirbharta, Make in India and Startup India is a great strategic intent. In the backdrop of a strong technological base provided by ISRO, DRDO, Technology and Innovation Centres of industries and PSUs, startups and technological hubs, a cogent National Technology Strategy and framework will strengthen the Industrial Fabric of India with global ambitions. Given a strong political will, demonstrated resolve of industry and demographic dividends, the time is ripe to strengthen the 'cocoon' through an effective technology strategy and with a view to export the products globally. The tech sojourn must become an illustrious lasting tech journey. Let us do it!

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