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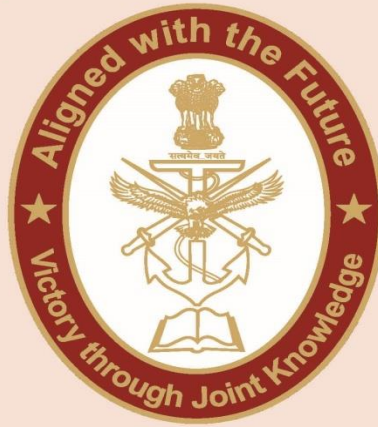
WEB ARTICLE

AATMANIRBHAR BHARAT THROUGH TECHNOLOGY SOVEREIGNTY

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**AATMANIRBHARTA
THROUGH
TECHNOLOGY
SOVEREIGNTY**



Lt Gen Anil Kapoor, AVSM, VSM (Retd) as DGEME on 31 Dec 2020. He has been DGIS also and has a penchant for strategic thinking in niche disruptive technologies, technology and innovation management, technology forecasting, technology planning and technology transition management.

“Bold Seismic Technology Transformation Begets Technology Sovereignty and will pave the way for Aatmanirbhar Bharat”

“Technology Sovereignty is a Journey and Not a Destination- Ape The Moving Target”

“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

India has taken up the coveted appointment of Presidency G 20, the most influential global body on 01 Dec 22. India vows to India's year-long G20 presidency will be "inclusive, ambitious, decisive, and action-oriented", PM

Modi said, adding that it will encourage an honest conversation on mitigating risks posed by weapons of mass destruction and enhancing global security. India today began its G20 presidency with a focus on counter-terrorism and "unity" in tackling global challenges, such as economic slowdown and climate crisis. The government also seeks to build consensus on debt sustainability and creating disaster and climate-resilient infrastructure. India's G20 plans also include a special focus on start-ups and bridging the digital divide¹. This is an opportunity for India to create synergies in gaining the required technology catalysts by creating consortiums for achieving a technological edge and take huge strides to lay strong foundations for Aatmanirbharta and technology sovereignty. With China plus one initiatives to create opportunities as a global manufacturing hub, it is time India gears up to have a manufacturing boom in the industrial corridors and lead the technology march with the support of global technology leaders.

India has given to the world strategic thinkers, technology wizards, technocrats and white collared vibrant professionals who have steered MNCs and start up Unicorns. Major National initiatives by ISRO, inSpace, DRDO and Captains of Industry have created excitement in Defence Industry resulting in export orders to the tune of Rs 17000 Crores in 2022-23, which shall scale up to the targeted Rs 35000 Crores by 2025.

Imbibing Technology By Choice

The Indian Integrated Guided Missiles Development Program (IGMDP), 1983 the first mega DRDO flagship to design and develop five guided Missiles, Agni as technology demonstrator, Prithvi as SSM, Akash and Trishul as SAMs and ATGM Nag, is a case study on technology sovereignty. The astounding success of ISRO in satellite launch vehicles, though bereft with dependence on imports of key technologies, a forward thinking Nation planned the IGMDP to become self-reliant in Missile Technologies. The Program had a structure, strategy, policy, a well-articulated roll - on plan and hand picked key scientists and defence officers and Captains of Industry for support. Close on heels of this strategic decision and a consequent roll out, Missile Technology Control Regime was slapped in Apr 1987 steered a consortium comprising by United

¹ Aditi Gautam, [India News](#), India Takes Over G-20 Presidency, PM Calls For "Mindset Shift": 10 Points, 01 Dec

States, United Kingdom, France, Germany, Canada, Italy; an endeavor to contain proliferation of missiles and missile technology. Under such technology denials by the G7 haves, India displayed a strong political will and put together a multi-pronged approach – developing indigenous research, developing Indian PSUs, developing Indian industry, premier Technical institutions including IISIT and a technology development consortium with Departments under the Government. The key lessons derived were that the payoffs were beyond missile technology and defence – materials for airframes, guidance control system hardware and software, inertial measuring units, onboard computers, propellants and liquid propulsion engines, precision technologies in hydraulics and pneumatic actuators, pyros and radio fuzes, to name a few, had applications in large number of dual use civil applications. The biggest impact was that India created the ignited minds with the confidence, conviction and commitment of YES, WE CAN. And India did It and continues to maintain the lead globally in the Missile – Space Technology Zone of Interest and Influence.

Managing VUCA – BANI Times Through Technology

Defence Forces have perennially been the vanguards in working through volatile, uncertain, complex and ambiguous, VUCA of the present, and are well prepared through contingency planning crystal gaze of the brittle, anxious, nonlinear and incomprehensible, the BANI future. Championing the VUCA -BANI times the thought process of the cerebral military mind is in the state of agility and well suited to create continuous disruption. That said, it is the Defence Forces which have always created management best practices, transformational leadership and technologies landscape with a dual use. DARPA of USA is well known to forecast, lead, design and develop technologies of relevance. Driven by the need to create integrated operational planning, decision support and interoperability for the out of area contingencies of US Defence and NATO Forces, world wide web was conceived and developed which is the basis of present day connected and networked world!

Driven by increased infiltration on the line of control, the border fencing was a good solution. Over a period of time various technology initiatives on the fence made it a smart fence but breaching the physical fence and its destruction in winters due to heavy snowfall were regular challenges. Further, nallahs and similar inundated areas could not be fenced. In 2016,

laser technology was envisioned as the invisible fence which was beyond detection and, therefore, hugely effective. Planning was done with DRDO Lastec Lab and a series of laser tech-based fences deployed with profound results. Laser based systems were also developed as a directed energy weapon system and optical sights-based sniper detection system. A laser technology driven euphoria was created with a series of successes and laser-based communication system also came to be a technology demonstrator. The congregation of IISIT, DRDO Labs and industry came together to create variety of equipment. As a fall out of this initiative, all these became dual use technologies and started getting deployed for number of applications in homeland security. The key lesson, once again, was that the spectrum of technology-based applications are germinated by an operational necessity and pollinate into a large number of dual use applications.

STRATEGIC TECHNOLOGY LANDSCAPE

The Elastic 4Ds Technology World Order

The New Tech World Order is defined by Four Ds – Data, Digitisation, Digitalisation and Disruption. While these have fueled digital transformation globally giving rise to a large number of dual use technologies which are drivers of automation & autonomous applications, it is disruption which is not only transforming technologies at an unprecedented pace, but also transforming business concepts, models, processes and practices. And while oil is being touted as the New Oil, Technology is the New Oil Refinery. India has harnessed this digital transformation and created agility in Bharat – Gati Shakti multifaceted National Master Plan, roll out of 5G, e-Governance initiatives under Digital India, UDAN-RCS, BharatNet, BHIM UPI, Ayushman Bharat and of course UIDAI Aadhar are some bigticket programs which has given a technological dominance globally and promoted ease of living in India. These local for global outreach programs and many more have created ripples globally.

The moot questions are - As one of the Emerging Global Power Centre of Technology how does India attain Technology Sovereignty? We are ranked the 17th technological advanced Nation and third largest military expending 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 are strategic technology management models and 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 Technology Strategy to create home grown solutions. The challenges and opportunities met by each have been enmeshed constructively in legislations and governance models to exploit research and development and empower the Nations. To name some USPs, USA has the Defence Production Act 1950, China went into the 100 years marathon starting 1949, Israel stood out innovatively as the Start-up Nation and mastered the theory of constraints for life cycle sustenance support and MRO². All created a technology strategy ESG system to gain the technology edge through National capacity building and capability development for self-reliance and export to achieve macro-economic dividends. There is a dire need for India to create an ecosystem that sans technology confetti to create an ecosystem for technology development.

Harnessing National Technology Thresholds & NextGen Technology Stack

The Battlefield Management Systems (BMS) has been a major program for net centric military operations. The Indian Regional Navigation Satellite System (IRNSS) with its operational name NavIC (Navigation with Indian Constellation) has immense applications in Ministries of Defence, Railways, Surface Transport, Inland Waterways, Fisheries and many more. RDSO of Ministry of Railways and ISRO came up with a joint program to design and develop solutions for real time train info system and management of unmanned level railway crossings. Based on a satellite transmit-receive chip and software on chip technologies, IRNSS and Gagan, this solution has created an autonomous railways operational system. This technology demonstrator has varied applications including BMS. The learnings from this example suggest that one technology program can be customized to many

² Anil Kapoor 'SYSTEMS THINKING TECHNOLOGY SOVEREIGNTY - THE PATH WAY TO AATMANIRBHATA', Nov 22

more applications. A suggestive salient futuristic technology stack which may be progressed as discrete programs, is given in the paragraphs below.

Resilient Assured Position, Navigation and Timing (PNT). The complete e-Governance structures, programs and applications are tending from automation to autonomy with or without man in the loop. These are based on precision and positioning, popularly called PNT which is dependent on the Global Navigation Satellite Systems (GNSS), GPS from US being the principal system for India. US is in the process of creating redundant regional PNT systems through terrestrial technologies, LEO satellites and pseudo satellites for assured PNT, should GPS be compromised by soft non kinetic cybertronic attacks or kinetic hard kills. There is a dire need to develop an indigenous Resilient PNT solution through home grown layers, a technology that has immense potential globally. Department of Space may be the lead for this tech D &D.

Semiconductor Chips and Software on Chip Technology. Silicon Carbide and Gallium based semiconductor foundries for chips need to be planned to become a global leader in semiconductor chips. Equally important, if not more, is the need to develop the technology of software on chip which is where a myriad of solutions and applications will reside. These will continue to drive the disruptive and emerging technologies globally.

Unmanned Autonomous Systems. Unmanned aerial, ground based, sea surface and underwater autonomous systems operating as swarms is a major global need for varied applications be it defence, logistics and supply chain, healthcare and medical sciences etc.

Automation to Autonomy (A2A) Technologies. The A2A technologies comprise an emerging technologies stack -AI, AR, VR, Wearables, IoT and sensors, blockchain, big data analytics, 5G and 6G software defined networks and communication systems, quantum technologies, cloud & quantum computing, cyber etc are the potential game changers to create multiplatform, multi sensor data fusion with a number of autonomous decision support systems. In defence, lethal autonomous weapon systems based out of outer space, aerial, terrestrial, sea based and underwater applications through C7 (command, control, communication, computer, cyber, cognition and combat) ISR is considered a complete net centric operational info management decision support system.

Renewable Energies and Power Management Systems. The future system power needs would be based on renewable sources and waste management systems with a autonomous power management system. These renewable sources based and electric vehicle technologies is yet another big ticket for future manned, unmanned and hybrid autonomous systems.

Cybertronics Defence Systems. The cyberattack on the Hospital Management Info System has highlighted the need to secure Digital Public Infrastructure and platforms through a very well designed cyber defence in depth systems. In addition, there is a dire need to adopt additional hardware and software cyber defence systems for critical installations and infrastructure. With the G20 Presidency cybertronics leading and hardening of digital infrastructure against cyber threats is yet another opportunity.

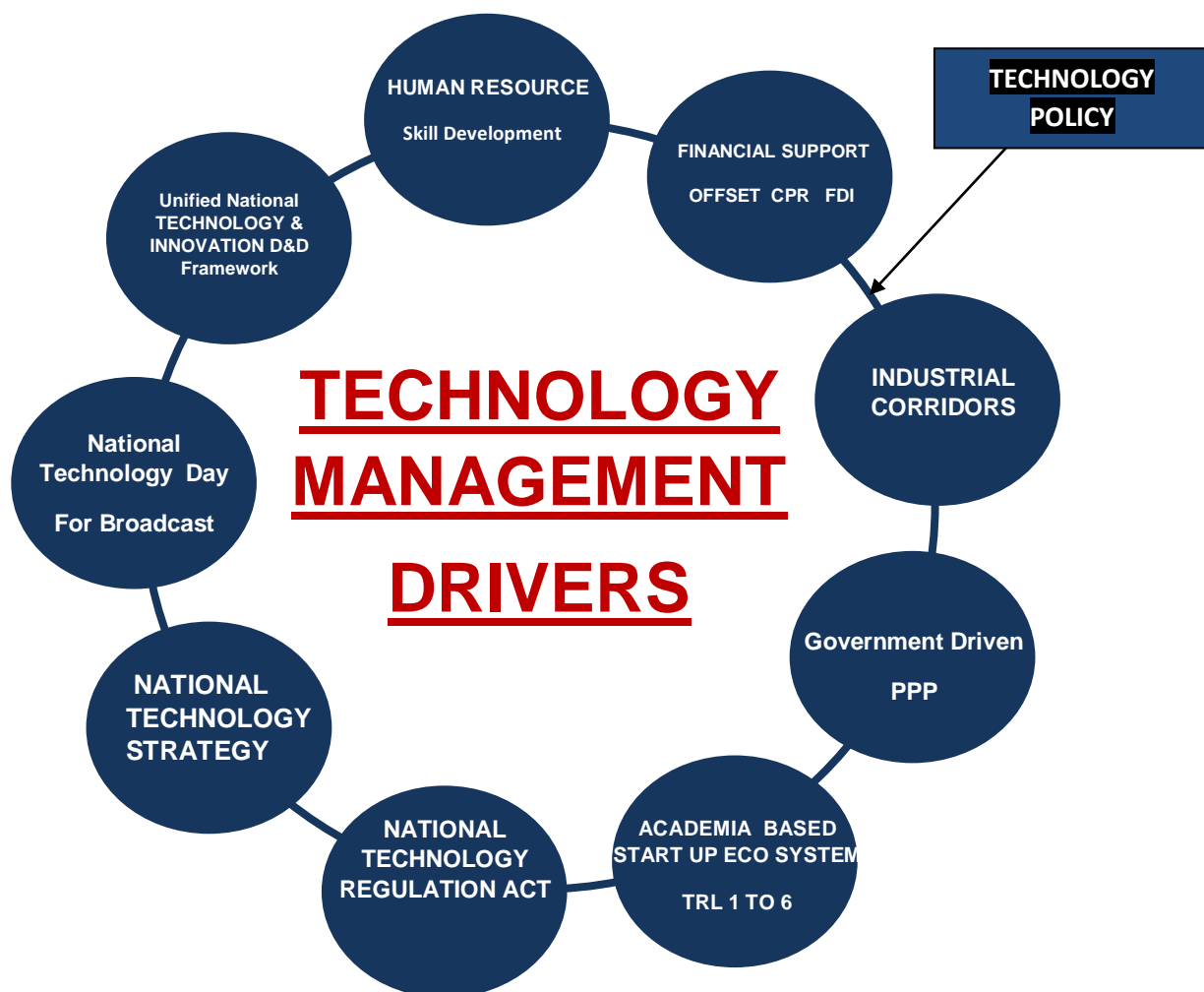
Transformational Paradigm For Technology Sovereignty

The best model to self-reliance is creation of our own unique Aatmanirbhar Bharat which gives homegrown indigenous solutions. This requires a bold seismic transformation through a well-articulated National Technology Framework (NTF) – incremental changes will not do. Given the momentum generated by the 12th Edition of Def Expo and the preparedness of Defence industry, there is a need to put in place a number of focused Programs for technology forecast and development. This calls for upscaling Department of Science and technology to Ministry of Technology and Innovation to provide a National technology framework, define a National Technology Strategy with a well thought through technology capability road map, an ecosystem for funding various technology readiness levels through Corporate Professional Responsibility (CPR)³ Funds akin to CSR Funds and a formalized skill development program. India's youth bulge is a 375 million and a huge demographic dividend. The skill development model in US needs a mention. The public libraries in districts are repositories of skill development where all citizens visit the library to learn future skills – 3D printing, Laser cutting, robotics, AI, AR, VR, cyber and many more free of cost which are sponsored by State and supported by industry and academia. We need to study and replicate this model.

³ Ibid,

Based on the above, it is imperative to encapsulate salient lessons for strategic management of technology. National Technology Strategy needs to be derived from the long term National Strategic and Security Strategy and should take into account each and every component of technology management function in an organisation. The key drivers of technology management are given in **Figure** ahead.

FIGURE - Key Drivers of Technology Management



Conclusion

Strong Technology Leaders beget Strong Technology Base and Strong Technology Base creates Technology Sovereignty. The New World Order respects Nations with the strength to manage VUCAD (Volatility, Uncertainty, Complexity, Ambiguity and Disruption). *India gained a tall Global Stature through COVID Vaccine which were developed and productionized in a record time – leaving the world eat out of our hands. A stark example of Vaccination Diplomacy through Vaccine Sovereignty.*

Aatmanirbharta, Make in India and Start Up India is a great strategic intent. In the backdrop of a strong tech base provided by ISRO, DRDO, Technology and Innovation Centres of industries & PSUs, Start-ups and T Hubs, a cogent National Technology Strategy and framework will strengthen the Industrial Fabric of India with global ambitions. Given the strong political will, the demonstrated resolve of industry and the demographic dividends, the time is ripe to strengthen through a well thought through technology strategy and fly out the technology globally. The tech sojourn must become an illustrious lasting tech journey. Let us do it!

CERTIFICATE

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