



## India and Advanced Computing Technologies

*This editorial is based on ["In an Era of Cyber Wars, India Needs A Fortified Computing Ecosystem"](#) which was published in *Hindustan Times* on 10/06/2022. It talks about India's initiatives on adoption of advanced technologies like supercomputers and quantum computing and the challenges associated.*

**For Prelims:** National Supercomputing Mission (NSM), Quantum Computing, Information Technology Agreement, PARAM Ganga, PARAM Siddhi-AI, QuEST Programme, National Mission for Quantum Technologies and Applications (NM-QTA), Quantum Key Distribution (QKD) solution.

**For Mains:** Advanced Computing Technologies - India's Progress and Challenges, National Supercomputing Mission - Success and Challenges, Quantum Computing and India - Applications, Challenges, India's Initiatives.

The 21<sup>st</sup> century is earmarked as **Information Technology driven** and **India is at the Centre of global attraction** and considered as a **knowledge powerhouse**.

Advanced mechanisms have taken over the field of computing, with governments, along with private companies, embroiled in a high-stakes race to **increase indigenous computing power for economic and strategic purposes**.

With India's data generation at an all time high, there is a **need to improve computational capabilities** by using **advanced computing technologies**.

### Advanced Computing Technologies - How much has India Progressed?

- **National Supercomputing Mission:** The [National Supercomputing Mission \(NSM\)](#), 2015, was the first step taken by the Government of India in this regard.
  - It is a jointly funded programme, by the **Department of Science and Technology (DST)** and the **Ministry of Electronics and Information Technology (MeitY)**.
  - The main objectives are to spearhead research in the **development of supercomputers** and build a **national supercomputing grid**.
    - As of May 2022, **India now has 15 supercomputers disclosed to the public**, with combined performance capability of 24 petaflops.
  - The NSM **recently deployed** [PARAM Ganga](#) - a High-Performance Computational (HPC) facility at IIT Roorkee.
    - [PARAM PORUL](#), a **state-of-the art Supercomputer** at NIT Tiruchirappalli was also inaugurated under the mission.
    - [PARAM Siddhi-AI](#) is the **fastest supercomputer in India** built under NSM.
- **Quantum Computing:** In 2018, the Department of Science & Technology unveiled a programme

called [Quantum-Enabled Science & Technology \(QuEST\)](#) and committed to investing Rs. 80 crore over the next three years to **accelerate research**.

- In the 2020 Budget speech, the Finance Minister of India announced the [National Mission for Quantum Technologies and Applications \(NM-QTA\)](#) with a total outlay of ₹8000 crore over five years for **strengthening the quantum industry** in the country.
- In 2021, the government unveiled the **indigenously developed** [Quantum Key Distribution \(QKD\) solution](#).
- The **domestic private sector of India has also been involved** in the development of quantum computing hardware, software, and algorithms.

## What are the Challenges Pertaining to Adopting these Technologies in India?

- **Slow Growth Rate:** Although there has been significant progress in the introduction of supercomputers in India, considering the distribution of the world's top 500 most powerful supercomputers, **India accounts for just 0.6% of the total**.
  - There is still a long way to go before India can develop an interconnected grid of supercomputers.
- **Slow Progress in Legislative Procedures:** Although the NM-QTA was announced in the 2020 Budget speech, the **mission has still not received any approval and no funds were allocated, disbursed or utilised** under NM-QTA during the FY 2020-21.
- **Limited Private Sector Involvement:** The Union Minister of Science & Technology has also claimed that for the NM-QTA, **no private sector partners had been identified yet** and no one from outside the government had been tapped for consultations for the national mission.
  - The government must recognise the leaps made by these companies.
- **Foreign Dependence:** The ability to build advanced computing facilities rests on raw materials.
  - It would be impossible to indigenously manufacture the whole system from scratch. This is where the **reliance on high-tech imports** kicks in.
  - Moreover, trade barriers — export control mechanisms and import restrictions — can **hamper access to the building blocks** of these systems.

## What Areas Need to be Worked Upon?

- **Better Policy Making and Regulations:** The focus should be to develop an **overarching strategy for the next 10-15 years** where it must be **ensured that there is no misallocation of resources** and that the efforts put in are concentrated in key areas that provide both economic and strategic benefits.
  - The primary focus must be on **establishing Centres of Excellence** dedicated to such advanced computing technologies within academic institutions as well as government research institutes.
  - A majority of the Indian **government's outlay has to be pumped into such institutions**. This can pay dividends in two ways:
    - It will help **create crucial** [intellectual property \(IP\) infrastructure](#) that can be used for the country's benefit.
    - The focus on research and academia will also **improve the talent pool and strengthen the domestic technology workforce**.
- **Liberalisation in Tech-Trade:** Advanced processors for supercomputers and cryogenic cooling systems for quantum computers are a necessity. But indigenously developing them will take time.
  - **Cutting down on import tariffs**, along with **embracing multilateral trade agreements** such as the [Information Technology Agreement](#) must be the government's priority.
  - Moving towards a **liberalised technology trade policy** can help the country accelerate its computing programme.
- **Nationwide Computing Grid:** **China's national computing network**, which talks about a **geographical approach to building data centres** and computing clusters across the mainland, **can serve as a blueprint** to scale-up computing infrastructure.
  - The concept of "**eastern data and western computing**" in China has been proposed, which involves setting up computing architecture in the less-developed western regions of

the country to handle the data stored in centres in the tech-aligned east.

- A computing grid in India can follow a similar pattern; the government, which has so far focused on academic research institutions as hosts for computing systems, must disperse these facilities.
  - **Creating a better network will improve the functioning** of an advanced computing grid and **handle large-scale data processing with ease.**
- **Advancing Computing from Military Lens:** India must focus on its computing strategy, **keeping the national security angle in mind.**
  - It is necessary to **develop India's computing power from a military lens**; it will facilitate the advancement of the military and improve computing technology.
    - In the age of information warfare and cybersecurity threats from across the border, **increased computational capacity is a necessary risk-mitigation tool.**
  - **Advanced computing facilities at strategic environments** such as **naval bases, air command control centres, and border outposts** can help in the faster analysis and real-time data processing that contains critical military intelligence.

### ***Drishti Mains Question***

What are the challenges associated with the adoption of advanced technologies (introduction of supercomputers, quantum computing) in India. Discuss the steps that can be taken to speed-up the adoption.

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