



Technological Penetration in Indian Army

This editorial is based on [“Marching ahead with technology absorption”](#) which was published in The Hindu on 09/04/2024. The article explores the pressing requirement to modernise the Indian Defence Sector. While the Indian military is progressing in a positive direction, the challenge lies in maintaining the absorption of technology while comprehending the requirements in a nuanced manner.

For Prelims: [Defence Research and Development Organisation \(DRDO\)](#), [Agni and Prithvi series of missiles](#), [Light Combat Aircraft, Tejas](#), [Department of Military Affairs \(DMA\)](#), [Integrated Guided Missile Development Program](#), [S-400 Air Defence Systems](#), [Sukhoi-30MKI aircraft](#)

For Mains: Indigenisation of Defence Sector, Challenges Related to the Defence Sector, Technological Absorption in India's Defence Sector.

The Indian Army is observing the year 2024 as the 'Year of Technology Absorption'. This theme underscores the Army's steadfast focus on embracing technology to transform itself so as to keep ahead of adversaries in the context of the evolving character of warfare. The means and end in this regard are visualised under the umbrella of Atmanirbharta.

In an era of uncertainty, the goals of [Atmanirbhar Bharat \(self-reliant India\)](#) and [Make In India](#) would mitigate risks on account of disruption or manipulation of critical supply chains - the kind of challenges that have constrained [Ukraine in its conflict with Russia](#).

The absorption will be mainly in terms of [disruptive technology \(DT\)](#) comprising [artificial intelligence \(AI\)](#), autonomous weapon systems such as drones, sensors, robotics, space technology, and [hypersonic weapon systems](#). Several nations, led by the US and China, have remarkable accomplishments in the field of DTs. The strategic competition and engagements in the future are going to be inevitably decided by the edge a nation possesses in absorbing these technologies.



What are the Different Aspects of Disruptive Technology in the Defence Sector?

▪ About:

- Disruptive technology refers to innovations that significantly alter the existing landscape of industries or sectors, often rendering previous technologies obsolete and reshaping traditional practices.
- In the defence sector, disruptive technologies have the potential to revolutionise warfare, redefine military capabilities, and transform the dynamics of national security.

▪ Characteristics:

- **Game-Changing Impact:** Disruptive technologies have the potential to revolutionise warfare by introducing novel capabilities or approaches that significantly alter the balance of power on the battlefield.

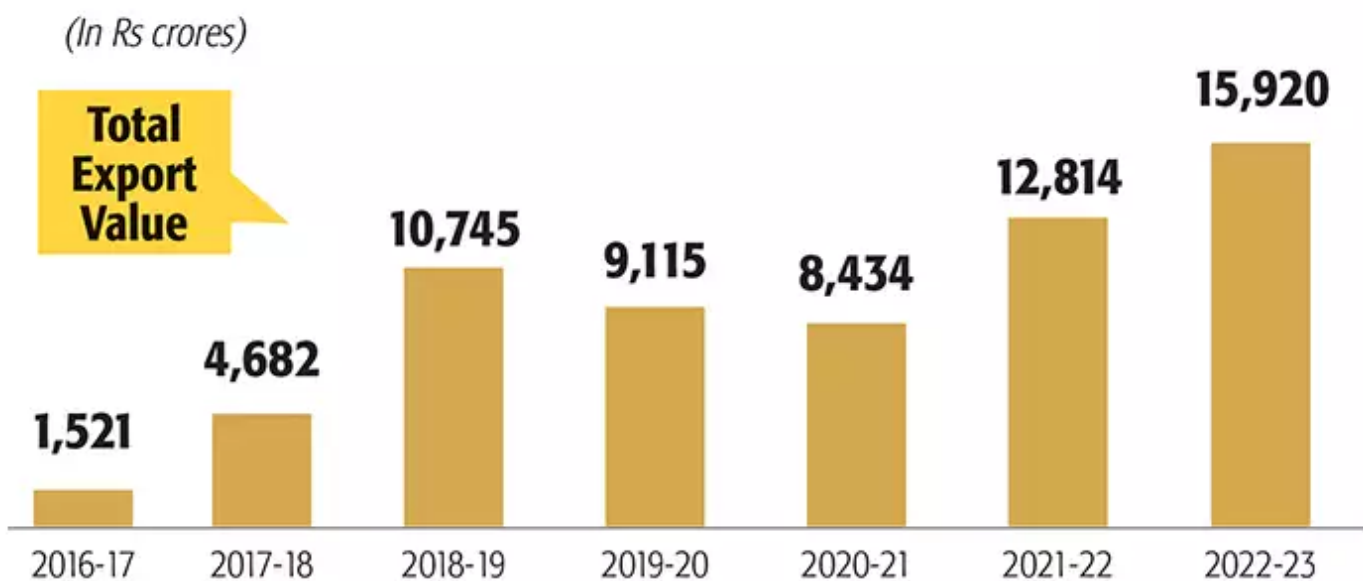
- **Rapid Advancement:** They often emerge from rapid advancements in fields such as artificial intelligence, robotics, cybersecurity, nanotechnology, and biotechnology, leading to exponential improvements in military capabilities.
- **Cost-Efficiency:** Disruptive technologies may offer cost-effective solutions compared to traditional systems, enabling militaries to achieve greater effectiveness with reduced resources.
- **Examples of Disruptive Technologies:**
 - **Unmanned Aerial Vehicles (UAVs):** UAVs, commonly known as drones, have revolutionised military reconnaissance, surveillance, and strike capabilities. They offer real-time intelligence gathering, precision targeting, and operational flexibility, transforming military strategies and tactics.
 - **Cyber Warfare:** Cyber warfare involves the use of computer networks to disrupt, disable, or sabotage enemy systems and infrastructure. Cyberattacks can target critical infrastructure, communication networks, and command-and-control systems, posing significant threats to national security.
 - **Hypersonic Weapons:** Hypersonic weapons travel at speeds exceeding Mach 5, making them extremely difficult to intercept and providing a rapid-strike capability against distant targets. These weapons have the potential to change the dynamics of conventional warfare by reducing response times and increasing operational flexibility.
- **Impact on Military Operations:**
 - **Enhanced Situational Awareness:** Disruptive technologies such as advanced sensors, data analytics, and artificial intelligence improve military's situational awareness, enabling commanders to make informed decisions in real-time and adapt to dynamic battlefield conditions.
 - **Precision and Lethality:** Disruptive technologies offer precision-guided munitions, autonomous systems, and enhanced targeting capabilities, resulting in greater accuracy and lethality in military operations while minimising collateral damage.
 - **Asymmetric Warfare:** Disruptive technologies enable smaller, technologically advanced forces to challenge conventional military powers through asymmetric warfare tactics, including cyberattacks, drone swarms, and electronic warfare.

What is the Relevance of Atmanirbhar Bharat in Modernising Defence Sector?

- **About:**
 - India is one of the few countries to have designed and produced a fourth-plus generation fighter aircraft, nuclear submarine, successful [Surface-to-Air Missile \(SAM\)](#) system, [Main Battle Tank \(MBT\)](#), an [ICBM](#) and an indigenised Ballistic Missile Defence System.
 - Despite a display of such high-end capabilities, over 50% of the Defence acquisition budget goes directly towards imports.
 - Out of the other 50% which goes to Indian vendors, 60% goes indirectly to international players because of imported components integrated into the weapon system. In keeping with the Make-In-India program and Atmanirbhar Bharat, Defence Acquisition Procedure (DAP) - 2020 was started.
 - The journey started with 'Self-sufficient' to 'Self-reliant' to 'Coproduction' to 'Private sector participation' to 'Make in India' and finally to 'Atmanirbhar Bharat'.
- **Defence Acquisition Procedure (DAP) - 2020:**
 - The [Defence Acquisition Procedure \(DAP\) 2020](#) prescribed 50% indigenous content (IC) in procurement contracts. To encourage foreign original equipment manufacturers (OEMs) to set up maintenance and manufacturing facilities in India, a new procurement category — Buy (Global-Manufacture in India) — has been introduced.
 - This will enable ab initio indigenisation of spare parts. The Ministry of Defence (MoD) has released several "[Positive Indigenisation Lists](#)" that mention items that must be procured only from domestic sources.
 - Nearly 5,000 items are currently imported by the Defence Public Sector Units (DPSUs) and the three Services figure in this list.
- **Make-In-India in Defence Sector:** Keeping in line with the National vision of 'Make in India' and to cater for the 'Military Capability Voids', the source of Capital Acquisition was broadly classified as just:- 'Indian'; or 'Not-Indian':

- **Indian:** For a product to classify as Indian and fulfil the 'Make in India' vision, the vendor and his weapon system should **provide either or all of the following:-**
 - Production Line set up in India.
 - Technology is owned by an Indian firm.
 - Jobs are created for Indians.
 - Taxes are paid to the Indian Govt.
 - Supply chain management is set up in India.
 - Comes to the market as an 'Indian Brand'.
 - Priority of procurement from the 'Indian' classification could be:-
 - Priority – I: Designed, Developed and Manufactured in India; or
 - Priority – II: Developed and Manufactured in India; or
 - Priority – III: Acquired and Manufactured in India; or
 - Priority – IV: Partnered with a foreign vendor but Manufactured in India.
 - All the above, under the category 'India', will satisfy the National vision of 'Make in India' and should be analysed and certified by the Department of Defence Production.
- **Not-Indian:** Equipment which doesn't fulfil the National vision of 'Make in India' should be classified as 'Not-Indian', when neither does the technology come to India nor is the manufacturing line is set up in India:-
 - A temporary manufacturing line in India to deliver a capability or,
 - An outright import from a foreign vendor.

THE RISING STORY OF DEFENCE EXPORTS



Different Technology Absorption Routes in Defence Sector

- **Co-development and Co-production:**
 - Co-development and co-production is seen as a very effective mechanism in state of the art technology induction and absorption. In joint development programs, the access to technology that individually the partnering companies / countries could not have developed is realised at substantially less cost and time.
- **Sub- Contracting / Contract Manufacturing:**
 - Sub-contracting / contract manufacturing occurs when a foreign vendor procures defence-related components, subsystems or products for export from industries in countries where the vendor has to meet offset obligations.
- **Joint Ventures:**
 - The technology inflows can be affected through establishment of Joint Ventures (JVs). However, the investment level remains a critical factor affecting the success of a Joint

Venture.

- In a Joint Venture with foreign equity participation restricted to 26%, the Original Equipment Manufacturers (OEMs), since they guard their Intellectual Property, may inhibit the collaborating partners from bringing in cutting-edge technology.

- **Licensed Production:**

- The transfer of technology (ToT) to a local defence industry capable of absorbing the technology, if implemented in true spirit, where both the supplier and the recipient are competent organisations, the local industry will be able to further develop the technology and this results in leapfrog on the existing technology lag.

- **Maintenance ToT and Training:**

- Long-term customer support activities have become mandatory. The training of local industrial partners and user agencies in maintenance of the system through applicable level of technology transfer ensures effective and committed maintenance support. The establishment of Maintenance Repair and Overhaul (MRO) Facility on partnership basis is an option to achieve this objective.

What are the Different Challenges in Absorption of Technology in the Defence Sector?

- **Low R&D Expenditure:**

- India's lack of focus on defence R&D and low overall researcher density have resulted in India being unable, thus far, to develop any breakthrough military technology or weapon system and remains amongst the largest importers of military equipment in the world.
 - India spends only 0.8% of the **GDP** on all R&D and has 156 researchers per million population. In comparison, the USA spends 2.8% of its GDP and has 4231 researchers per million population, China spends 2.0 % of GDP and has 1113 researchers per million population and Israel spends 4.8% of GDP and has 8255 researchers per million population.

- **Ineffective Relevance and Depth of Technology:**

- The vendor (under DAP-2020) may offer transfer of technology not directly related to the product or system being procured. Hence, the offers from foreign vendors need very careful and in-depth scrutiny to ensure that the technology being offered is relevant to defence applications both current and futuristic.

- **Licensing Issues:**

- Frequently, it is found that the technology concerned is subject to approval of the foreign government and hence obtaining the latest technology becomes difficult. In many areas of cutting-edge technologies, foreign suppliers do not part with their technologies citing patents, IPRs etc., or may fix enormous prices for the same.
- Even in cases where the supplier is willing to sell the technology for a price, the governments in question do not permit the same under their respective export control regime.

- **Concerns Regarding Determination of Multiplier Factor:**

- Since technology absorption becomes a key component of the offset agreement, suitable multiplier factors may need to be worked out, if required, to promote and encourage the foreign supplier who is willing to transfer the necessary technology.
- The negotiated value of the technology is often based on the foreign supplier's prior investment in r&d, the market value of the technology or the cost of developing the technology in India, which makes it disproportionately costlier.

- **Cybersecurity Vulnerabilities:**

- The growing reliance on digital technologies and networked systems in the defence sector exposes it to various cyber threats and attacks. Lack of robust cybersecurity frameworks, incident response mechanisms, and preparedness to mitigate evolving cyber risks.

- **Technological Obsolescence:**

- The equipment and platforms used by the Indian military tend to have long service lives, resulting in a mismatch with the fast-evolving technological landscape. Delayed modernisation and upgradation programs lead to the armed forces operating with

increasingly outdated systems.

- Weak industry-academia linkages and limited technology transfer from foreign collaborations constrain the development of indigenous defence technologies.

▪ **Technology, Not the Sole Determinant of War:**

- Analysts suggesting a military revolution due to new technologies argue that modern battlefields are more lethal. However, recent conflicts like Russia-Ukraine and Armenia-Azerbaijan (Nagorno-Karabakh) show that the actual lethality experienced is not significantly different from earlier wars. This indicates that while technological advances are important, they are not the sole factor determining outcomes in war.

What are the Different Suggestions to be Incorporated to Ensure Smooth Technology Absorption?

▪ **Technological, Operational and Tactical Adaptations:**

- Technical countermeasures in wars quickly limit the performance of new technology-enabled weapons employed by an adversary. The most important adaptations are often not technological but operational and tactical, i.e., how a military fights at various levels. They involve changes in the way armies use the tools at their disposal.
- In present battle conditions, weapon platforms such as tanks must adapt to become more survivable. This will require a change in tactics and a greater integration of different types of capabilities. With a plethora of sensors on the battlefield, it has become almost impossible to hide these tanks.

▪ **Technological Progress, Together with Conventional Methods:**

- Rather than discarding conventional platforms in favour of purely digital solutions, the technology and its attributes need to be at the centre of planning for future plans. This will be a process that starts with the acknowledgement of vulnerabilities and sensitivities and the gap between them.
- One of the reasons behind 'Russia having the upper hand over Ukraine' on the battlefield now is the Russian army employing traditional methodologies to fight the war. Aspects such as consolidating traditional defence lines and a stronger military industrial base reliant on technological advancements are what matter finally.

▪ **Understanding the Potential of Latest Technologies:**

- An understanding of the latest technologies, their potential, and the context in which they can be utilised are essential. The absorption will have to visibly manifest itself at the unit levels, as against being controlled only at the higher levels. This democratisation in employing technology at cutting-edge levels is an imperative to usher in true transformation.

▪ **Technology Absorption Necessarily Including Multiple Aspects:**

- Technology absorption will also necessarily include several relevant aspects such as organisational restructuring, the management of human resources and cultivating specialists not merely at the higher levels but also decentralised at execution levels, civil military fusion, having a structure and policies to ensure data integrity, and having a procurement policy that is applicable to disruptive technologies.

▪ **Harnessing Potential of iDEX and DISC:**

- Certain very pragmatic initiatives have recently been taken by the Government such as the [iDEX \(innovation for Defence Excellence\)](#) and the DISC (Defence India Start-up Challenge) which will strengthen the innovation ecosystem. These programs aim to mobilise the capabilities available in the larger Indian start-up ecosystem to develop products for the armed forces and harness the available talent within the country.

Conclusion

Successful absorption of technology in the defence sector requires a comprehensive approach that addresses not only technological challenges but also organisational, human resource related, and policy considerations. It is crucial to focus on organisational restructuring, human resource management, decentralisation of expertise, civil-military fusion, ensuring data integrity, and implementing procurement policies suitable for disruptive technologies. By addressing these macro-level aspects, defence establishments can effectively absorb and integrate new technologies, enhancing their capabilities and

readiness in an evolving security landscape.

Drishti Mains Question:

Discuss the impact of technology penetration in the defence sector on modern warfare and national security. How can India leverage these advancements effectively?

UPSC Civil Services Examination, Previous Year Question (PYQ)

Q.1 Consider the following in respect of Indian Ocean Naval Symposium (IONS): (2017)

1. Inaugural IONS was held in India in 2015 under the chairmanship of the Indian Navy.
2. IONS is a voluntary initiative that seeks to increase maritime co-operation among navies of the littoral states of the Indian Ocean Region.

Which of the above statements is/are correct?

- (a) 1 only
- (b) 2 only
- (c) Both 1 and 2
- (d) Neither 1 nor 2

Ans: (b)

Q.2 Which one of the following is the best description of 'INS Astradharini', that was in the news recently? (2016)

- (a) Amphibious warfare ship
- (b) Nuclear-powered submarine
- (c) Torpedo launch and recovery vessel
- (d) Nuclear-powered aircraft carrier

Ans: (c)