Mains Topics

India's Manufacturing Sector

Context

India's growth trajectory stands in sharp contrast to countries like China and South Korea, as manufacturing did not evolve into a robust engine of structural transformation.

Glimpse of India' Manufacturing Sector

- Manufacturing in **India contributes around 15–17% of GDP.**

- India's manufacturing output is **about USD 490 billion**, representing approximately **2.9% of global manufacturing.**

- In India, about **11.4% of the workforce** is employed in manufacturing

- India's manufacturing output grew **4.26% in FY 2024-25,**

Why a Well-Developed Manufacturing Sector is Needed

- **Employment Generation:** Manufacturing creates **large-scale jobs**, particularly for semi- and low-skilled workers, reducing reliance on informal or agricultural work.
  - Manufacturing also stimulates **ancillary sectors** like logistics and services through multiplier effects.

- **Economic Growth & Structural Transformation:** Manufacturing supports economic transformation by shifting labour and capital from low-productivity agriculture to higher-productivity industry.
  - It increases value addition and raises average incomes.

- **Export Promotion and Trade Balance:** Manufactured goods often form a significant part of **global exports**, earning foreign exchange and improving trade balances.

- **Foreign Direct Investment (FDI) & Supply Chain Shifts:** Strong manufacturing sectors attract FDI and global supply chains.
  - They help countries **integrate deeply into the global production network**.

- **Technology Upgradation & Innovation:** Manufacturing drives technological progress, R&D, automation, and productivity enhancements.

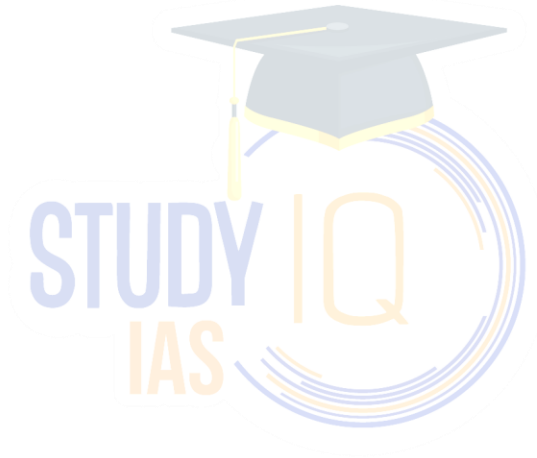### Why India Manufacturing Sector is Stagnant

- **High Informality & Low Productivity:** A large share of manufacturing employment remains **informal**, restricting skill formation, technology diffusion, quality upgradation, and stable industrial relations.

- **Absence of Economies of Scale:** Dominance of **micro and small enterprises** prevents firms from scaling up, reducing cost competitiveness in global markets.

- **Weak Innovation Ecosystem: Low R&D intensity**, with Gross Expenditure on R&D at only **~0.6–0.7% of GDP**, far below countries like China and the US.

- **Divergent Growth Architecture:** India's growth has been largely **consumption-led**, unlike **China's investment- and export-driven manufacturing model**.

- **Technology & Cost Constraints:** Limited automation and slow adoption of advanced technologies.
  - **High logistics and input costs** erode manufacturing competitiveness.

Way Forward

- **Strategic Deployment of Frontier Technologies:** Accelerate adoption of **AI/ML, robotics, advanced materials, and Industry 4.0 tools** across manufacturing value chains.
- **Boost R&D Investment:** Incentivise private-sector R&D.Establish **centralised research hubs and Technology Transfer Offices (TTOs)** as advocated by **NITI Aayog**.
- **Workforce Upskilling:** Revamp **ITIs and polytechnic curricula** to align with modern manufacturing and digital skills.
- **Development of Industrial Clusters:** Create **plug-and-play, technology-enabled industrial parks** with shared R&D facilities, testing labs, and **5G connectivity**.
- **Address Structural & Regulatory Bottlenecks:** Simplify entry norms for new firms. Reduce tariffs on critical raw materials. Streamline land access and approvals for industrial use.

Source: The Hindu

Gig Workers Issues

Context

Delivery workers of major quick-commerce and food delivery platforms — Swiggy, Zomato, Blinkit and Zepto — launched two rounds of strikes on Christmas Day and New Year's Eve.

- The strikes were led by the Indian Federation of App-based Transport Workers (IFAT), protesting against unsafe 10-minute delivery models and poor working conditions.

Why the Protest?

- **Precarious incomes** and declining take-home pay.
- **Algorithm-driven work allocation** forcing workers to cover long distances for low compensation.
- **Rising fuel and maintenance costs** borne by workers.
- **No formal social security** (insurance, pensions, paid leave).

About Gig Workers

- Gig workers are individuals who **engage in short-term, temporary, or freelance work arrangements**, often through digital platforms or apps, rather than holding traditional long-term employment with a single employer.
- These workers typically perform specific tasks or projects on a flexible, as-needed basis, and are **usually paid per job or "gig" rather than receiving a regular salary.**
- In its working policy paper on the gig economy, NITI Aayog has made projections of the gig workforce **expanding to 23.5 million workers by 2030.Increased safety risks** due to time-bound hyper-fast delivery models.

Reasons Behind the Rise of Gig Workers

- **Technological Advancements:** The **development of digital platforms and mobile apps** has made it easier for workers to find and complete short-term jobs.
  - **Increased internet and smartphone penetration** have enabled more people to access gig work opportunities.
- **Economic Factors: Traditional job creation has been slow**, and gig work has become a crucial livelihood source for many job-seekers.
  - Gig work provides an **additional income stream for individuals** needing to supplement their earnings from other jobs or those between jobs.
- **Flexibility and Autonomy**: Gig work offers **flexibility in work hours and locations**, appealing to those seeking better work-life balance.
  - This led to increased labour participation by students/women by offering part-time work as per convenience.
- **Demand for On-Demand Services**: There is a growing **demand for on-demand services** such as ride-sharing, food delivery, and freelance work, driving the need for gig workers.

Work Issues Faced by Gig Workers

- **Revenue Sharing**: Gig workers often protest against the unfair revenue sharing models set by the platforms.

- **Financial Instability**: Earnings can be inconsistent and unpredictable, leading to financial instability.

- **Long Working Hours**: Many gig workers face long and irregular working hours **without additional compensation**.

- **Lack of Legal Protections**: The existing legal framework is not well-suited to address the complexities of gig work, as it is **based on traditional employer-employee relationships**.

  ○ Platforms classify gig workers as independent contractors, which excludes them from benefits and protections available to traditional employees.

- **No Access to Benefits**: Gig workers lack access to essential social security benefits such as health insurance, paid leave, and retirement plans.

  ○ Overwork and lack of safety regulations can lead to accidents and health issues.

State government Initiatives for Gig Worker in India

- **Rajasthan** enacted the *Platform-Based Gig Workers (Registration and Welfare) Act, 2023*, mandating registration, transaction-based welfare cess, and a grievance redressal system for gig workers.

- **Karnataka** introduced the *Platform-Based Gig Workers (Social Security and Welfare) Bill, 2024*, which ensures algorithmic transparency, fair contracts, and aggregator contributions to a welfare board.

- **Tamil Nadu** launched a scheme offering **₹20,000 subsidies for e-scooters, insurance coverage, and worker lounges** for registered gig workers.

- **Andhra Pradesh** runs the *YSR Vahana Mitra Scheme*, providing ₹10,000 annually to self-employed drivers for vehicle maintenance and insurance.

Flaws in the Existing System

- **Lack of Alignment with International Standards:** India has not ratified the **ILO's (International Labour Organisation) Social Security (Minimum Standards) Convention, 1952 (No. 102)**, reflecting weak commitment to universal social protection.

- **Ambiguities in the Social Security Code, 2020:** The Code provides **unclear definitions** of gig and platform workers.

  ○ **Diluted safeguards** and **centralised oversight** have led to **delays in implementation**, limiting its impact on ground.

- **Dysfunctional Welfare Boards:** Welfare Boards, the main distribution mechanism for benefits, have proved **inefficient and opaque**:

  ○ **₹70,744 crore** in cess funds for construction workers remain unused.

  ○ In **Tamil Nadu**, ₹221.8 crore in dues were not remitted by 99 local bodies.

  ○ In **Kerala**, only **5 out of 16** boards were found functional; some reported **zero beneficiaries**.

- **Fragmented and Piecemeal Approach:** Targeted schemes for specific sectors (e.g., beedi workers, gig workers) create **inequity** and fail to address the **shared precarity** of informal labour.

○ Such an approach **neglects intersectionality** and leads to **exclusion** of equally vulnerable groups like domestic workers.

● **Overreliance on Gig Work as a Solution:** The assumption that gig work will formalise informal labour is **flawed**.

○ Most gig jobs lack **security, stable income, and employer accountability**, which are core features of formal employment.

● **Ineffective Use of Data and Platforms:** While initiatives like **eShram** aim to register informal workers, the **lack of integration with welfare delivery mechanisms** limits real benefits.

○ Absence of **real-time data sharing** across departments weakens targeting and tracking.

What Needs to Be Done?

● **Universal Social Protection Floor:** Shift from targeted schemes to a **rights-based, universal framework**, ensuring **minimum social security for all workers**, regardless of category.

● **Strengthen and Reform Welfare Boards:** Ensure **transparency, fund utilisation**, and **real-time audits** of Welfare Boards.

○ Introduce **performance-based reviews** and **technology-driven tracking** of beneficiaries.

● **Decentralised yet Coordinated Governance:** Leverage the **flexibility given to states** under the Code to **innovate and adapt** schemes locally while ensuring **national minimum standards**.

● **Clarify Legal Definitions:** Amend the Code to provide **clear, inclusive definitions** of gig, platform, and other informal workers to reduce ambiguity.

● **Integration of Databases and Portals:** Link **eShram, Ayushman Bharat**, and **pension accounts** with **labour management systems** for better tracking and delivery of benefits.

● **Continuous Monitoring and Feedback Mechanisms:** Institutionalise **worker feedback loops** and **social audits** to improve design and delivery of schemes.

Source: Indian Express

Why does India need a Climate Resilient Agriculture

Context

Amid rising climate volatility, declining soil health, and food security concerns, there is a renewed focus on Climate-Resilient Agriculture (CRA) as a strategic necessity for India.

What is meant by Climate-Resilient Agriculture (CRA)?

- **Climate-Resilient Agriculture** refers to farming systems that **anticipate, adapt to, and withstand climate shocks** while maintaining or enhancing productivity and environmental sustainability.
- It combines:
  - **Biotechnology tools**: biofertilizers, biopesticides, microbial soil enhancers.
  - **Genome-edited / climate-tolerant crops** resistant to drought, heat, salinity, and pests.
  - **Digital and AI-based solutions**: precision farming, climate advisories, yield prediction.
- **Core aim: Reduce dependence on chemical inputs** while ensuring stable yields under climate stress.

Why does India Need Climate-Resilient Agriculture?

- **High climate vulnerability**: ~**51% of net sown area is rainfed**, producing ~**40% of India's food**.
- **Yield risks**: Climate models project **3–22% decline in rice yields** by century's end; worst cases exceed **30%**.
- **Food security pressure**: Growing population demands **higher and more reliable productivity**.
- **Limits of conventional farming**: Chemical-intensive agriculture struggles under heat stress, erratic rainfall, and soil degradation.
- **Strategic autonomy**: CRA can reduce **food import dependence** and strengthen long-term food sovereignty.

Where does India Stand Today?

- **Early institutional groundwork is in place**: **Indian Council of Agricultural Research** launched *National Innovations in Climate Resilient Agriculture (NICRA)* in **2011**.
  - Climate-resilient practices demonstrated in **448 villages**, including System of Rice Intensification (SRI), Aerobic rice, direct-seeded rice, Zero-till wheat, & Climate-tolerant crop varieties
- **Policy support**: **National Mission for Sustainable Agriculture (NMSA)** focuses on rainfed areas, soil health, and water efficiency.
  - **BioE3 policy** positions CRA as a priority for biotech-led solutions.
- **Technology ecosystem**:
  - Strong public research base (ICAR, DBT, IARI).
  - Commercial availability of **biofertilizers and biopesticides**.
  - Growing **agritech startups** offering AI advisories and precision tools.

Limitations in India's Climate-Resilient Agriculture (CRA)

- **Low Adoption by Small Farmers:** High costs, limited awareness, and fragmented landholdings restrict large-scale uptake of CRA technologies.

- **Quality Issues in Bio-inputs:** Inconsistent standards and weak regulation of biofertilizers and biopesticides reduce farmer trust.

- **Slow Spread of Climate-Resilient Seeds:** Delays in development, approval, and uneven inter-State adoption of tolerant and genome-edited crops.

- **Digital Divide:** Limited access to internet, devices, and digital literacy hampers AI-based advisories and precision farming.

- **Fragmented Policy & Institutional Framework:** Lack of a unified national CRA roadmap and poor coordination among ministries slow implementation.

Other Countries stance of CRA

- **United States:** CRA mainstreamed via **USDA Climate-Smart Agriculture & Forestry (CSAF)**.
  - Multi-billion-dollar investments in climate-smart practices.
- **European Union:** CRA embedded in **EU Green Deal** and **Farm to Fork Strategy**.
  - Targets reduced chemical inputs and sustainable food systems.
- **China:** Focus on **climate-tolerant crop breeding**, digital agriculture, and water-saving irrigation.
- **Brazil:** Global leader in **tropical climate-resilient crops**, driven by EMBRAPA's (Brazilian Agricultural Research Corporation) biotech research.

What is the Way Forward for India?

- **Accelerate Climate-Tolerant & Genome-Edited Crops:** Fast-track R&D, approvals, and field adoption.

- **Strengthen Bio-input Quality & Supply Chains:** Enforce standards for biofertilizers and biopesticides to build farmer trust.

- **Bridge the Digital Divide:** Expand access to AI-based advisories, climate forecasting, and precision tools for smallholders.

- **Support Farmers Financially:** Climate insurance, targeted subsidies, and easy credit during transition.

- **Build a Coherent National CRA Roadmap:** Align **biotechnology, climate adaptation, and agriculture policies** under the BioE3 framework.

- **Focus on Soil & Water Restoration:** Integrate CRA with soil health cards, micro-irrigation, and watershed management.

Prelims Topics

Rakhigarhi

Context

Chief minister of Haryana recently allocated ₹500 crores for the redevelopment of Rakhigarhi as a Global Heritage site.

About Rakhigarhi

● Situated in **Hisar district of Haryana**, along the now-dry **Drishadvati (Ghaggar-Hakra) river system**.

● The site was excavated by **Amarendra Nath of ASI**.

● **Largest known IVC site in India** (larger in area than Mohenjo-daro within Indian territory).

● **Major Findings of Rakhigarhi:**

   ○ **Urban Settlement Pattern:** Evidence of a **Mature Harappan planned township**.

      ■ Houses built with **mud bricks and burnt bricks**.

      ■ Presence of a **well-developed drainage system**, reflecting advanced urban planning.

   ○ **Seals and Pottery:** Discovery of a **cylindrical seal** bearing **five Harappan script characters** and an **alligator motif**, a rare find.

      ■ Well-developed **ceramic industry**, dominated by **red ware**, including Dish-on-stand, Vases, Perforated jars.

   ○ **Ritual Practices:** Excavation of **animal sacrificial pits** lined with mud bricks.

      ■ Presence of **triangular and circular fire altars** on mud floors, indicating **ritualistic and ceremonial activities**.

   ○ **Burials and Social Life:** Discovery of **extended burials**, possibly belonging to a **very late phase (even medieval)**.

      ■ Excavation of **female burials with rich grave goods**, including Pottery, Jasper and agate beads & Shell bangles

      ■ Indicates **social stratification and funerary customs**.

   ○ **Other Antiquities:** Stone blades, Terracotta and shell bangles, Beads of semi-precious stones, Copper objects, Animal figurines, Terracotta toy cart frame and wheel, Bone points and Inscribed steatite seals and sealings.

Source: Indian Express

Fiscal Squeeze

Context

The Indian government is facing a fiscal squeeze in FY26, where revenue growth is weak but fiscal deficit targets may still be met.

What does Fiscal Squeeze Mean?

● A **fiscal squeeze** refers to a situation where the **government's expenditure obligations rise faster than its revenue**, leading to **tight budgetary space**.

● It forces the government to **cut spending, raise taxes, increase borrowing, or reprioritise expenditure**.

● Common during **economic slowdowns, high subsidies, debt servicing pressures, or welfare expansion**.

● **Key Causes of a Fiscal Squeeze:**

   ○ **Revenue slowdown** due to weak economic growth or tax buoyancy.

   ○ **Rising committed expenditure** (interest payments, salaries, pensions, subsidies).

   ○ **External shocks** (pandemics, wars, oil price spikes).

○ **Populist fiscal measures** without matching revenue sources.

Source: Businessline

K-4 Missile

Context

Defence Research and Development Organization (DRDO) successfully tests K-4 submarine-launched Ballistic Missile from INS Arighat.

About K-4 (Kalam-4) Missile

● **K-4 / Kalam-4** is a **nuclear-capable, intermediate-range submarine-launched ballistic missile (SLBM)**.

● It has an operational **range of about 3,500 km**.

● **Specifically designed for deployment on Arihant-class nuclear submarines**, including **INS Arihant** and **INS Arighat**.

● **Significance:**

  ○ Forms a critical pillar of **India's nuclear triad**, ensuring a **credible second-strike capability**.

  ○ Enables India to conduct nuclear deterrence **from underwater platforms**, enhancing survivability.

Source: Hindustan times

25 years of PMGSY

Context

Pradhan Mantri Gram Sadak Yojana (PMGSY) marks 25 years of transformative impact in 2025.

About Pradhan Mantri Gram Sadak Yojana (PMGSY)

● **Launched in: 2000**

● **Ministry:** Ministry of Rural Development

● **Objective:** To provide **all-weather road connectivity** to **unconnected rural habitations**.

● **Coverage Criteria:**

  ○ Habitats with a population of 500 and above in plain areas,

  ○ 250 and above in North-Eastern and Himalayan States/UTs, and

  ○ Habitations located in special category areas, including Tribal (Schedule V) regions, Aspirational Districts/Blocks, and Desert areas.

● **Fund Sharing (Centre–State): Plain States: 60:40, North-Eastern & Himalayan States: 90:10, & Union Territories: 100% Central funding.**

● **Phases of Implementation:**

  ○ **PMGSY – Phase I:** Launched in December 2000

    ■ Focused on **providing all-weather road connectivity to eligible unconnected rural habitations** based on population thresholds.

  ○ **PMGSY – Phase II:** Launched in 2013.

    ■ Aimed at **upgrading existing rural roads** and improving rural road network quality where connectivity had been provided.

  ○ **PMGSY – Phase III:** Launched in December 2019.

    ■ Focuses on **consolidating the rural road network** by up-grading **Through Routes and Major Rural Links** that connect habitations with: Gramin Agricultural Markets (GrAMs), Higher Secondary Schools, Hospitals.

  ○ **PMGSY – Phase IV:** Approved on 11 September 2024 for the period FY2024-25 to FY2028-29.

    ■ Aims to provide new all-weather connectivity to eligible habitations that have become eligible on account of population growth and updated criteria.

- **Achievements: T**he Pradhan Mantri Gram Sadak Yojana (PMGSY) has **sanctioned a total of 8,25,114 km of rural roads, of which 7,87,520 km have been completed,** reflecting nearly **95% physical progress** as of December 2025.

Source: PIB

100 Years of CPI

Context

The Communist Party of India (CPI) is marking 100 years of its formation on 26th December 2025.

About CPI

- **Origin:** December 26, 1925 (Kanpur/Cawnpore conference)
- **Ideology:** Marxism–Leninism, Democratic Socialism, Anti-imperialism
- **Political position:** Left-wing
- **Background:**
  - Emerged from the influence of **Russian Revolution (1917) and** Marxist ideas of **class struggle and socialism**
- **Objectives (as envisioned in 1925):**
  - End **British colonial rule** in India.
  - Establish a **Workers' and Peasants' Republic**.
  - **Socialisation of means of production and distribution**.
  - Protection of workers', peasants' and marginalised sections' rights.
- **Role in India's Freedom Struggle:**
  - Active participation in: **Trade union movement** (through AITUC) & **Peasant struggles**
  - Faced colonial repression: **Kanpur Bolshevik Case (1923)** & **Meerut Conspiracy Case (1929)**

- Led mass movements like: **Tebhaga movement (Bengal) & Telangana peasant struggle.**
- **Post-Independence Role:** Adopted a **parliamentary democratic path.**
  - Formed or participated in governments in Kerala, West Bengal & Tripura.
  - **1964 split resulted in formation of CPI (Marxist)**, due to ideological and strategic differences.

Source: Indian Express

Village Defense Guards

Context

J&K army training Village Defence Guards to enhance operational readiness.

About Village Defense Guards

- **Background:**
  - **Village Defence Committees (VDCs)** were first raised in the **mid-1990s** in the erstwhile **Doda district** as a **force multiplier** against militant attacks.
  - VDCs have now been **restructured and renamed as Village Defence Guards (VDGs)**.
  - They operate mainly in rural and border areas of **Jammu and Kashmir**, especially in the **Jammu division.**
- **Purpose:**
  - To **enhance local self-defence capacity** in vulnerable villages.
  - To act as a **first line of defence** against terror strikes in remote areas.
  - To **supplement security forces** in counter-insurgency operations.
- **Composition:**
  - Comprise **local civilian volunteers** from identified villages.

○ Members are **armed and trained by the Government of India**.

● **Functions:**

○ **Village security:** Protect villages from militant attacks and infiltration.

○ **Intelligence gathering:** Provide **local-level intelligence** to police and security forces.

○ **Support role:** Assist security agencies during **counter-terror and search operations**.

○ **Deterrence:** Act as a visible deterrent against militant movement.

● **Command & Control:** Function under the **supervision of the District Superintendent of Police (SP) / Senior Superintendent of Police (SSP)**.

○ Operate in coordination with: Local police, Army and paramilitary forces (as required)

Why Revival of VDCs / Strengthening of VDGs is Being Demanded

● **Rising terror incidents** in previously peaceful areas of Jammu division.

● **Distinct militancy dynamics** due to mixed demographic composition (Hindus and Muslims).

● Increased incidents such as **infiltration attempts, recovery of war-like stores, explosions and targeted attacks & discovery and neutralisation of militant hideouts**.

● Recognition that **local participation** is critical in long-term counter-insurgency success.

Source: Newsonair

Bomb Cyclone

Context

A powerful winter storm rapidly intensified into a "bomb cyclone" across large parts of the United States.

What is Meant by Bomb Cyclone?

● A Bomb Cyclone is an **extremely fast-intensifying mid-latitude storm**.

● It forms through a process called **bombogenesis**, when atmospheric pressure drops by **at least 24 millibars within 24 hours**.

● This rapid intensification leads to **very strong winds, heavy rain or snow, storm surges, and coastal flooding**.

● Typically occurs over **cold ocean waters** where **warm air collides with cold air**, common in the **North Atlantic and North Pacific**.

● Though not a tropical cyclone, its impacts can be **as severe as a hurricane**.

What is a Blizzard?

● A **Blizzard** is a **severe snowstorm** defined not just by snowfall, but by **strong winds and low visibility**.

Source: TOI

Justice Mission-2025

Context

China conducted military drills named "Justice Mission 2025" around Taiwan.

About Justice Mission 2025

● It is a **high-intensity, two-day military exercise** conducted by China's **People's Liberati**

PLA Justice Mission 2025 military exercises
Date: Dec. 29 to 6 p.m. on Dec. 30

on Army (PLA).

- It involves **live-fire missile launches** along with coordinated **air and naval manoeuvres**.

- **Objective:**
  - Designed to **simulate blockade operations** and **precision strikes**.
  - Focuses on targeting **ports, sea lines of communication, and maritime infrastructure** linked to **Taiwan**.
  - Tests joint-operations capability and rapid escalation scenarios.

Source: **The Hindu**

National Technology Readiness Assessment Framework

Context

The Principal Scientific Adviser to the Government of India has unveiled the National Technology Readiness Assessment Framework (NTRAF).

About National Technology Readiness Assessment Framework

- The framework aims to serve as the **operational backbone for various R&D funds** launched under national missions.

- **Key Features:**
  - **Enable funding bodies:** To allocate resources with greater precision and de-risk early-stage technologies for private investment.
  - **Rigorous methodology to assess projects:** Across the 9 Technology Readiness Levels (TRL) - ranging from Proof of Concept (TRL 1-3) to Prototype Development (TRL 4-6) and Operational Deployment (TRL 7-9).
  - **Global Best Practices**: Adapted from global standards (such as NASA) but tailored to the specific needs of the Indian R&D ecosystem.
  - **Objectivity over Subjectivity:** Replaces qualitative estimation with a structured, evidence-based checklist for every stage of development.
  - **Sector-Specific Nuances:** Includes specialised annexures for distinct sectors like Healthcare & Pharmaceuticals and Software, acknowledging that development pathways differ across domains.
  - **Self-Assessment Tool:** Empowers Project Investigators to realistically gauge their standing and identify technical gaps before seeking funding.

Source: **PIB**