

# Scientific Advancements in India

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India is recognized globally for its scientific rigour and potential. After all, this is the land of Ayurveda, the land of climate sensitivity demonstrated through the Chipko Movement back in the 1970s, the land where successful nuclear tests like Pokhran-II were conducted, the land where science maestros C.V. Raman (Nobel Prize in Physics 1930) and Anna Mani were born.

India was able to gain pace in scientific discovery only after independence. Getting back the reigns of democracy and planning the years ahead to regain our prosperity encouraged people to work towards scientific and technological advancements. In all these years, India witnessed a massive shift in these fields of discovery by strategically aligning its skills and resources.

Here's looking back at the accomplishments of India in the field of science and technology post-independence, and the developments we are progressing towards:

## **1947 - 1957**

**Establishment of a Five-Year plan which prioritized scientific research:**

- The Planning Commission in India was set up in 1950 with an aim to ideate and plan the actions to be taken in key sectors such as agriculture, science, infrastructure, and education. The first-ever plan draft was presented in July 1951 and had a dedicated chapter on 'Scientific and Industrial Research'. Being the first plan, it prioritized laying the foundation of scientific research in the country and largely focused on initiatives for building or enhancing national laboratories and research centers:
- It recognized eleven research institutes at the national level and stressed their importance in the development of the country's future. These included the National Physical Laboratory of India (Delhi), National Chemical Laboratory (Pune, Maharashtra), and Central Electrochemical Research Institute (Karaikudi, Tamil Nadu) among others.
- Some of these institutes only had nucleus units and needed more investment for their expansion. The plan provided for the completion of buildings and installation of the necessary equipment to enable the laboratories to function fully.
- It also proposed the setting up of three new institutes: Radio and Electronics Research Institute; Mechanical Engineering Research Institute; Central Salt Research Station.

### **1957 - 1967**

#### **Focus on agricultural research and emergence of the 'Green Revolution'**

After independence, regaining control of agriculture production was a task. Research about the crop yield potential of locations across the country, irrigation systems, effective fertilizers, pesticides, power sources, agricultural equipment was lacking. Government prioritized scientific research for advancing agriculture. This led to the Green Revolution during this decade. This enabled India's agrarian economy, which was on the brink of collapse in 1947, to improve steadily. This revolution made us self-reliant, as we traveled the distance from being an importer of food grains to one producing it in surplus.

### **1967 - 1977**

#### **Aryabhata – India's first satellite**

Aryabhata was India's first satellite, named after a ancient Indian mathematician (5th century AD). It was **launched by the Russians on 19 April 1975 from Kapustin Yar. The 96.3 minute orbit had an apogee of 619 km and a perigee of 563 km, at an inclination of 50.7 degrees.**



India's contribution to the science of space is immense. The Indian Space Research Organization (ISRO) was established in 1969 to serve as India's national space agency. The first-ever Indian satellite was the 'Aryabhata', which was designed and manufactured in India and was launched on 19<sup>th</sup> April 1975. ISRO developed Aryabhata to execute X-ray astronomy, aeronomy and solar physics.

### 1977 – 1987

#### Postage Stamp & Currency Note was launched to Co-memorate



#### **AGNI – India's strategic missile**

India successfully developed strategic missile systems in the 1980s, with successful testing of Agni in 1989. Eventually Indian scientists were able to demonstrate abilities such as re-entry, maneuvering range, control, guidance, two-stage propulsion and stage separation. Since then, India has created, tested, operationalized several missile systems. The Agni became a series of missiles, with the latest one being Agni-V, successfully tested in 2018.

### 1987 – 1997

#### **DNA fingerprinting**

DNA fingerprinting in India came into existence in 1988 when Council of Scientific and Industrial Research–Centre for Cellular and Molecular

Biology (CSIR–CCMB) scientists developed the technique and made it available for use, making India the third country to develop its own DNA fingerprinting probe.

### **1997 - 2007**

#### **Pokhran-II nuclear test**

On 11<sup>th</sup> May 1998, India successfully tested five nuclear bombs underground in Pokhran, Rajasthan—these tests were titled ‘Pokhran-II’. In order to facilitate the technological achievement of an emerging democracy, this day was named ‘National Technology Day’ by our then Prime Minister Shri Atal Bihari Vajpayee. It is observed each year.

### **2007 - 2017**

#### **Chandrayaan-I mission to the moon**

Chandrayaan-I was India’s first-ever mission to the moon, launched on 22<sup>nd</sup> October 2008 from Sriharikota, Andhra Pradesh. The spacecraft hovered around the moon to deliver chemical, photo geologic, and mineralogical mapping to ISRO.

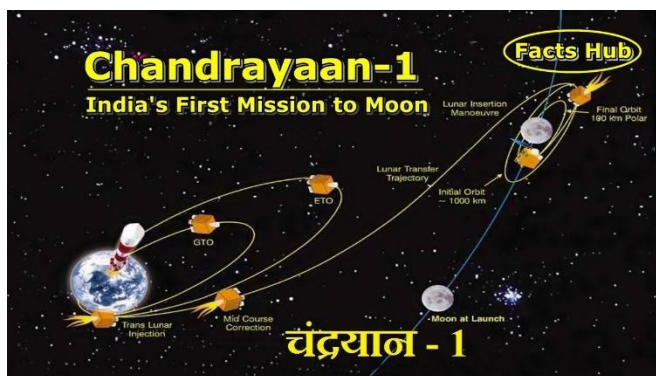




## India's first lunar exploration mission



Chandrayaan-1 (transl. Moon-craft,) was the first Indian lunar probe under the Chandrayaan program. It was launched by the Indian Space Research Organisation in October 2008, and operated until August 2009. The mission included a lunar orbiter and an impactor. India launched the spacecraft using a PSLV-XL rocket on 22 October 2008 at 00:52 UTC from Satish Dhawan Space Centre, at Sriharikota, Andhra Pradesh



## Polio-free India;1955-2014.

India accounted for around 60% of the global cases of polio in 1994. A full scale and intense immunization program was launched to eradicate polio, a life time crippling disease affecting children and impacting their whole life. This is fully preventable with a timely immunization of the babies at a scheduled time.

**A Pulse Polio Program was launched in 1955 and was declared 27<sup>th</sup> March 2014 by the World Health Organisation.**

A dedicated campaign to vaccinate every child by the Government enabled us to become polio-free within two decades.

India received the '[Polio-free](#)' certification from [World Health Organization \(WHO\)](#) on 27<sup>th</sup> March 2014.



This immunization drive was a success because of strong policy, committed healthcare professionals, front-line and community workers. A large part of this campaign was the education of those hesitant to get vaccinated in backward and rural areas of the country, by increasing

awareness about its safety and benefits.

### **Mars Orbiter Mission (MOM) (also known as Mangalyaan)**

A historic first for India—its first ever interplanetary mission. MOM marked India's place in the field of space exploration. Launched on [5<sup>th</sup> November 2013](#), MOM studied Mar's topography, morphology, mineralogy and atmosphere. Apart from the scientific breakthroughs, MOM is also lauded for its cost effectiveness.

### **Encouragement of start-ups**

The Government launched the '[Startup India](#)' program on 16<sup>th</sup> January 2016 to develop an ecosystem to encourage indigenous scientific, technological and innovative development in India. Since then, the number of Indian startups has increased and is growing. As of July 2021, there are [more than 52,000 start-ups in the country](#), making India one of the largest start-up ecosystems in the world. These start-ups have resulted in creation of more than 5 lakh jobs. The [top ten sectors for start-ups in India](#) are IT services, healthcare & life sciences, education, professional & commercial services, food & beverages, agriculture, finance technology, technology hardware, construction and green technology. These are some of the successful Start ups:

#### **2017 - till present**

- [CRED](#)
- [upGrad](#)
- [Groww](#)
- [Zepto](#)
- [Skyroot Aerospace](#)
- [MBA Chai Wala](#)
- [Spinny](#)
- [The Good Glamm Group](#)
- [GrowthSchool](#)
- [BluSmart](#)

## ISRO's Gaganyaan Programme from 2006.



The Gaganyaan Programme is designed to demonstrate human spaceflight to Low Earth Orbit (LEO) (as per NASA, LEO is considered to be the area in Earth's orbit that is near enough to Earth for convenient transportation, communication, observation and resupply; this is the area where the 'International Space Station' currently orbits). This programme is expected to set the stage for efficient and effective Indian human space exploration in future. Two unmanned missions and one manned mission have been approved by the Government under the Gaganyaan Programme.

Nation's first step towards establishing a sustained Indian human space exploration program. This mission is expected to provide India the opportunity to collaborate with global space station development, along with employment generation for a scientifically thriving younger population.

### First Space Suit Developed in India

#### Specifications

- **Spacecraft type** Crewed
- **Design life** 7 days
- **Launch mass** 7,800 kg (17,200 lb.) (Includes service module)
- **Dry mass** 3,735 kg (8,234 lb.)
- **Crew capacity** 3

## Dimensions

- **Diameter:** 3.5 m (11 ft.)
  - **Height:** 3.58 m (11.7 ft.)
  - **Volume** 8m<sup>3</sup> (280 cu ft.)[4]
  - **Power** Photovoltaic array
  - **Regime** Low Earth orbit

## History

Preliminary studies and technological development of Gaganyaan started in 2006 under the generic name "Orbital Vehicle".

The plan was to design a simple capsule with an endurance of about a week in space, a capacity of two astronauts, and a splashdown landing after re-entry.

The design was finalized by March 2008 and was submitted to the Government of India for funding. The funding for the Indian Human Spaceflight Programme was sanctioned in February 2009, but it fell short of full political support and it obtained limited developmental funding.

## COVID-19 vaccine research and vaccination drive

India had been at the forefront of vaccine development research, eventually becoming one of the largest manufacturers and exporters of COVID-19 vaccines. As of end-2021, we have supplied over 7 Crore COVID-19 vaccine doses to more than 90 countries.





Further, the scale of India's vaccination drive has been unprecedented. As of February 2022, more than 170 crore vaccination doses have been administered.

As we continue to evolve and innovate, the aim is to maintain the pace of development in science and technology, along with ensuring global recognition and exposure.

- **500 GW of non-fossil fuel energy capacity by 2030: India will meet this target**

India's Central Electricity Authority (CEA) has done a projection for the country's energy mix for 2030. According to this, India's installed capacity of non-fossil energy for electricity generation — solar, wind, hydel and nuclear in 2019 was 134 GW and by 2030 it will be 522 GW. This will require solar energy installed capacity to go to 280 GW and wind energy to go to 140 GW.

According to this, total installed capacity will be 817 GW and power generation will be 2,518 billion units in 2030.

*Under this scenario and energy trajectory, India will be able to meet its 500 GW of non-fossil fuel energy capacity by 2030.*

|   |              | Installed capacity (GW) 2019 | %    | Generation (Billion Units) 2019 | % of generation 2019 | Installed capacity (GW) 2030 | % of installed capacity 2030 | Generation (Billion Units) 2030 | % of generation |
|---|--------------|------------------------------|------|---------------------------------|----------------------|------------------------------|------------------------------|---------------------------------|-----------------|
| 1 | Coal and gas | 228                          | 63   | 1,072                           | 80                   | 282                          | 36                           | 1,393                           | 56              |
| 2 | Hydro        | 45                           | 12.5 | 139                             | 10.1*                | 61                           | 7.5                          | 206                             | 8               |
| 3 | Renewable    | 82.5                         | 22.7 | 126                             | 9.2                  | 455                          | 54.5                         | 805                             | 32              |
| 4 | Nuclear      | 6.7                          | 1.9  | 378                             | 2.7                  | 19                           | 2.3                          | 113                             | 5               |

## Solar Energy

The World Bank is committed to supporting India's solar energy push. The Bank is providing more than \$1 billion to support India's solar plans, starting with a Grid Connected Rooftop Solar project that aims to put solar panels on rooftops across the country, and 100MW of energy has already been financed through this project.



**Modhera, in Mehsana District in Gujarat** India's is first Solar Powered village in India. Its completely Green Energy Efficient and all villagers are happy to have completely reduced their expenses on energy as well as it is Green and Environment friendly.



First Solar Powered Village; Modhera Gujarat



Solar Street Light



Solar Ground Water Pumping System



Solar Water Heater

## Digital Retail Banking & Marketing

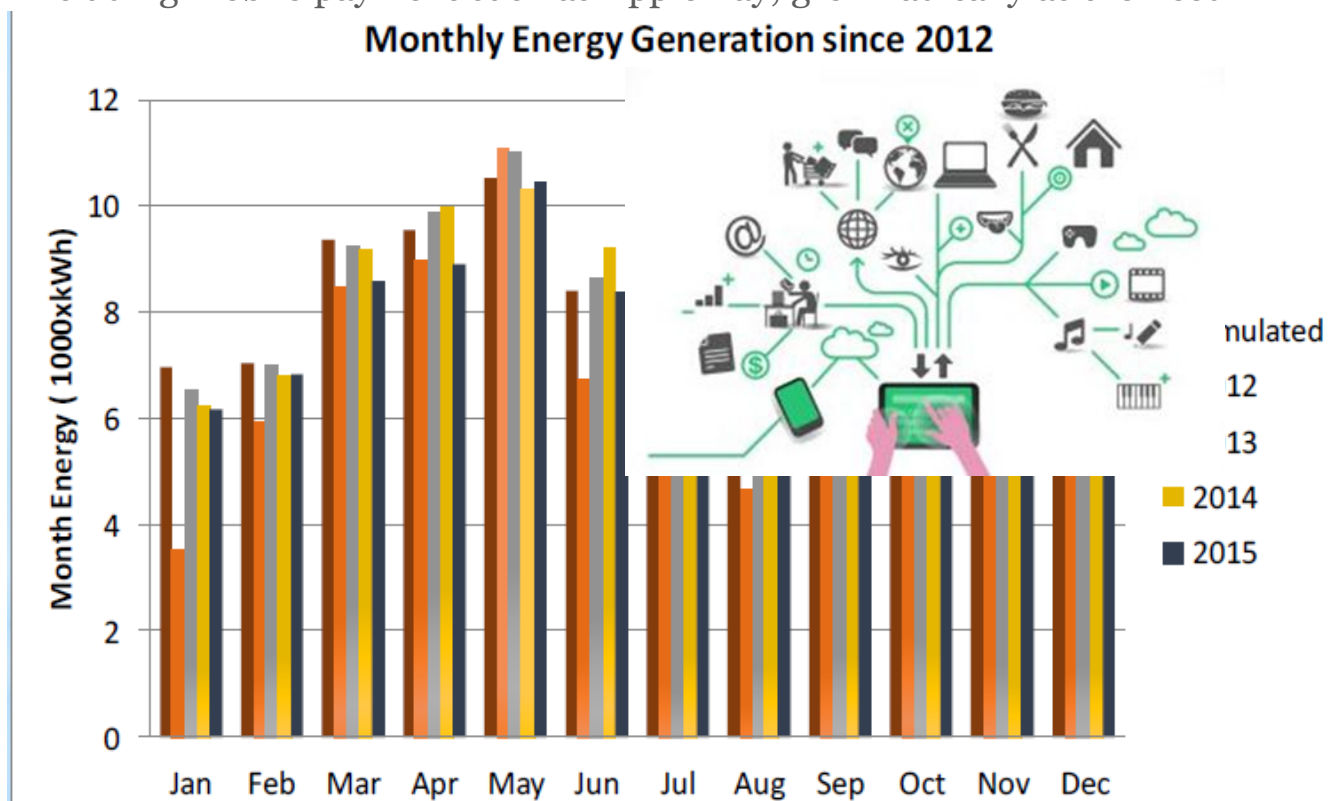
Retail marketing has undergone a sea change particularly from the days of Pandemic and given way to door-step supply with an efficient and innovative supply chain management system with a much wider outreach, involving small and medium enterprises to reach out to their clients through internet connectivity. Amazon is the biggest example of door-step retail marketing. A lot of start-ups got opening with minimum cost to sell their goods through Amazon. While the visiting clients in shops reduced considerably, door-step Shopping created employment opportunities for delivery boys, store keepers, packers and package industries and rapid transportation of goods to reach out to buyers.



## Digital Retail Banking and Technology driven Digital Payment Methods

Technology has opened the door to a new age of purchasing and has altered the payment path for transactions, turning it into the ‘Internet of Things’ era.

As online purchases soar and purchasing is made easier, payment methods have also been catching up thanks to the advancement in transaction capabilities that the internet and technology have created. Frictionless payment plays a key component in today's shopping experience, amongst other things. We have seen contactless payment, including mobile payment such as Apple Pay, grow radically as the need



for convenience and ease from consumers remains a dominating factor in retailing today.

Consumers are shifting towards wireless devices using voice interfaces to order and pay for items, such as the Amazon Echo. [Euromonitor International](#) estimate that nearly 81 million wireless speakers will have been sold worldwide in 2017, with a growth of 84% on top of that between 2017 to 2021. Companies have also been working with biometric information to further enhance the shopping experience using payment methods with more technological designs such as iris scanning, fingerprint verification and facial recognition as a quicker and more secure way to purchase.



Payment transactions will also be rated on how easy and quickly an item can be purchased, allowing consumers to purchase things online as a guest without the necessity to sign in or become a member. Additionally, “Buy” buttons have been popping up across social media platforms including Twitter, Pinterest, Instagram and Facebook.



Online Banking experiences have been very convenient and time& expense saving, apart from being safe and secure.

Scientific Research, Advancements in Information Technology is creating global impacts now on the lives of the common people, benefitting them immensely with introduction of user friendly methods of payments and Banking etc, which has impacted wonderfully the Digital Retail Marketing, cutting down costs immensely, reflecting on increased profits.

World is Technology Driven now. We need to update ourselves on Smart Technologies.

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**Best Regards**

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