

Table of Content

Executive Summary	.3
Advantage India	.5
Market Overview and Trends	.7
Porters Five Forces Framework	23
Growth Drivers	24
Opportunities	34
Case Studies	39
Industry Organisations	42
Useful Information	44



EXECUTIVE SUMMARY



Large consumer base

- With a US\$ 1.86 trillion economy in FY17 and per capita income of over US\$ 1,538.5 in 2016-2017, India presents a unique opportunity for companies to tap the huge consumer base demanding technologically advanced products
- Demand for cheap and durable products that could meet the local requirements drives the need for innovation

Huge talent pool

- 3rd largest technical manpower in the world
- 162 universities awarding 4,000 doctorates and 35,000 postgraduate degrees
- Global share in scientific publications rising at a CAGR of ~12 per cent
- India ranks 8th in the world in terms of number of students graduating in science and engineering stream

Policy framework

- Policies aimed at projecting India as a Science and Technology powerhouse and promoting both public and private sector involvement in the R&D practice
- Women Scientific programme to expose women more and more towards research

Rising investments

- With more and more multinational companies setting up their R&D centres in India, the sector has seen an uptrend in investments in recent years
- Under the Union Budget 2018-19, the Department of Space, Government of India has been allocated Rs 107.83 billion (US\$ 1.66 billion) for 2018-19, which includes Rs 65.76 billion (US\$ 1.02 billion) for research and development in the areas of spacecraft and launch vehicle manufacturing

Source: RBI, India Budget

EXECUTIVE SUMMARY



Pharma sector driving R&D growth

 India's pharmaceutical industry, which accounts for about 1.4 per cent of the global pharmaceutical industry in value terms and 10 per cent in volume terms, is expected to remain a major R&D growth driver

Rapidly growing overseas investment

Cumulative overseas direct investments by India grew at a CAGR of 31.73 per cent, during FY08-17, reaching US\$ 331 billion during FY17 from US\$ 21 billion in FY08, global car makers are also looking to move their R&D investments in India

Sixth-largest R&D investor

- India's Gross Expenditure on R&D (GERD) increased from Rs 24,117 crore (US\$ 5.38 billion) in 2004-05 to Rs 104,864 crore (US\$ 15.63 billion) in 2016-17.
- India's R&D spend is estimated at US\$ 77.46 billion in 2017 from US\$ 72.85 billion in 2016.
- As of 2016, India is the world's sixth largest annual R&D spending country, accounting for 3.64 per cent of global R&D expenditure and is estimated at 3.75 per cent in 2017.
- R&D spending in India is anticipated to grow from 0.9 per cent to 2.4 per cent of the country's GDP from 2016 to 2034 respectively

Notes: R&D - Research and Development; Figures mentioned are as per latest data available

Source: Reserve Bank of India, R&D Magazine, International Monetary Fund, World Bank, CIA Fact Book, OECD, Aranca Research





ADVANTAGE INDIA



- Rising income and evolving lifestyles have led to higher demand for aspirational products
- Indian companies' investments in R&D is not surprising given the importance of innovation to sustain competition
- Son a demand Indian players are set to benefit from expiration of patents
- Expanding middle class and increasing affordability are expected to remain demand drivers for technologically advanced products
 - Establishment of CoEs in various areas; NMITLI initiative on PPP basis
 - Increased investments by private players; setting up of R&D centers
 - In CY 2017, patent applications by Indian start-ups increased 15 times to 909 from 61 in CY 2016.

 Apple has submitted 5 applications with the Indian Patent Office in 2016, for innovations related to digital payments. Facebook is also looking to tap into the mobile wallet market of the country.

India is the top exporter of IT products and has the 3rd largest pharma sector and a fast growing contract research segment

3rd largest technical manpower in the world

ADVANTAGE INDIA

- PPP for promoting exchange of scientific knowledge and R&D
- Strengthening educational infrastructure
- Amendments to the Patents Act (1970) to make it TRIPS-compliant
- Setting up of NIC in 2010
- Adoption of Science, Technology and Innovation Policy 2013

Notes: F - Forecast, E - Estimated, IPR - Intellectual Property Rights, CoE - Center of Excellence, PPP - Public Private Partnership, TRIPS - Trade Related Aspects of Intellectual Property Rights, NMITLI - New Millennium Indian Technology Leadership Initiative, NIC - National Innovation Council; Figures mentioned are as per latest data available

Source: IPI India Annual Report, Aranca Research





MARKET OVERVIEW AND TRENDS

EVOLUTION OF SCIENCE AND TECHNOLOGY POLICY FRAMEWORK IN INDIA



2003 2013 2014 2015 2016

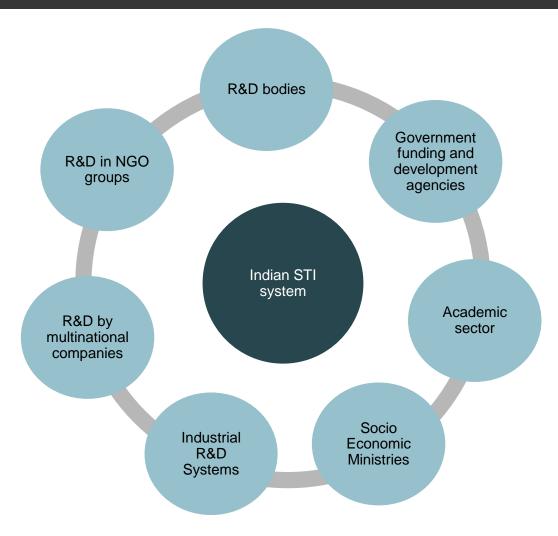
- Technology Policy to bring science and technology together and emphasize the need for investment into R&D to address national problems.
- Science, Technology and Innovation
 Policy aims to develop synergies between science, technology and innovation. Ethnic diversity and varying demographics attracted investment from various players
- New Initiatives such as SWAYAM (Study Webs of Active-Learning for Young Aspiring Minds), etc. have been taken to support young talent and attract innovation
- "Innovation of Science Pursuit for Inspire Research (INSPIRE)" initiative was launched to communicate with the youth population and attract talent to the scientific field
- The total plan outlay allocated under the Union Budget 2015-16 for the Department of Science and Technology is around US\$ 557.1 million

- Scientific and Technological (S&T) Activities Survey 2015-16 aims to collect data on resources devoted to R&D in science and technology. The information is collected from about 5000 R&D organisations present across the country.
- New Initiatives such as the Science, Technology, Innovation and Creation of Knowledge (STICK) framework has been taken by the Indian government to support innovation.

Source: Department of Science and Technology, Ministry of HRD, Government of India, Union Budget 2016-17

INDIAN SCIENCE and TECHNOLOGY SYSTEM





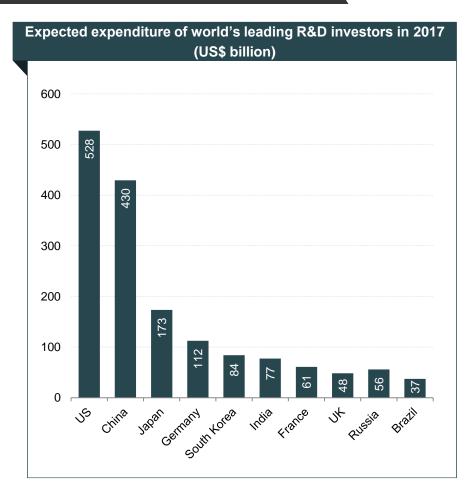
Note: STI refers to Science Technology and Innovation

Source: Changing Indian STI Landscape Presentation, Department of Science and Technology

INDIA AMONG THE WORLD'S LEADING R&D INVESTORS



- India's R&D investments increased to US\$ 77 billion in 2017 from US\$ 71.48 billion in 2016.
- R&D investments has helped Indian companies to overcome tight competition with affordable products internationally.
- The Indian Robot Mitra, designed in Bengaluru and made in China, which can recognise people by their nationalities and guide customers in a bank, attracted the attention of Chinese manufacturers at an information technology (IT) event held at Dalian, China.



Notes: R&D - Research and Development; **Source:** Nature Magazine, Battelle

MANPOWER AND INVESTMENTS



India has a strong network of science and technology institutions and trained manpower

- India is among the top-ranking countries in the field of basic research
- It has the 3rd largest scientific and technical manpower in the world
- 162 universities award 4,000 doctorates and 35,000 postgraduate degrees annually
- The Council of Scientific and Industrial Research runs 38 research laboratories
- India ranks 7th among highly productive countries in science and technology research.
- In April 2017, the Department of Science and Technology introduced a US\$ 297.48 million pilot programme to encourage more girls and women to take up careers in the domain of science and engineering. The programme will cover 100,000 girls and women, from school-going children to those interested in research, will be launched later this year.
- In January 2018, South Korea-based technology major, Samsung, is planning to hire 1,000 engineers from top institutes for the company's three R&D facilities in India.
- Similarly, in February 2018, Bosch India Group announced plans to hire 10,000 engineers over the coming years to work on futuristic technologies at its R&D centre in India.

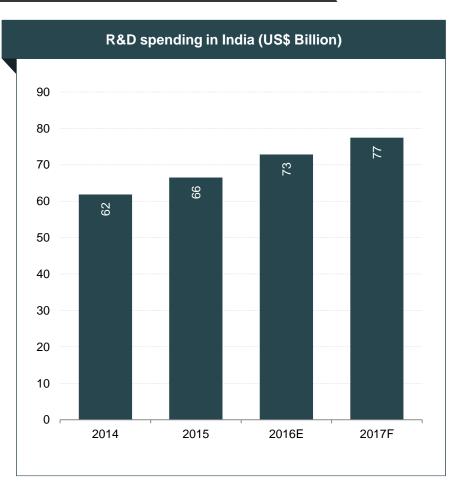
Strengthening India's position in research through investment

- R&D investments have grown in India to around US\$ 67.7 billion by 2015 and reached US\$ 72.85 billion in 2016 and are estimated to reach US\$ 77.46 billion by 2017.
- As of December 2016, Government of Arunachal Pradesh allocated funds worth US\$ 22.92-30.55 million for the development of science and technology sector in the state.
- A series of new investments were recently announced by Cisco India to enhance cyber security infrastructure in India. It will enable to build transparent and secure digital infrastructure environment for accelerating India's digital transformation. For strategic cyber security cooperation.
- Cisco India has signed an MoU with Indian Computer Emergency Response Team (CERT-In) to establish a threat intelligence sharing programme.
- Under the National Initiative for Developing and Harnessing Innovations (NIDHI) programme, Indian Government plans to invest US\$29.75 million for setting up 100 incubators across the country in the next 4 years to support start-ups.
- Spending on artificial intelligence (AI) by Indian companies is expected to increase by 8-11 per cent over the coming 18 months backed by rising influence of AI-based solutions across verticals.

STRONG GROWTH IN R&D INVESTMENTS IN INDIA OVER THE YEARS



- India's share of global R&D spending rose to 3.64 per cent in 2016 from 3.48 per cent in 2015. It is further expected to rise to 3.75 per cent in 2017.
- As of March 2017, World Intellectual Property Organisation (WIPO) stated that India is emerging as a leader in frugal and demand driven innovation among various countries across the globe.
- In May 2017, the central government has introduced various startup intellectual property protection schemes with an aim to ease patent filing for startups and promote awareness and adoption of IP rights.
- To facilitate protection and commercialising of IPRs, these schemes will be providing access to high-quality Intellectual Property services and resources. Moreover, under these schemes, the central government bears the fees of the facilitators for patents, trademarks or designs that a startup may file. Startups only have to bear the cost of the statutory fees payable.
- India was ranked 13 in CY 2017 by Nature Index, which publishes tables based on counts of high-quality research outputs based on natural sciences in the previous year.

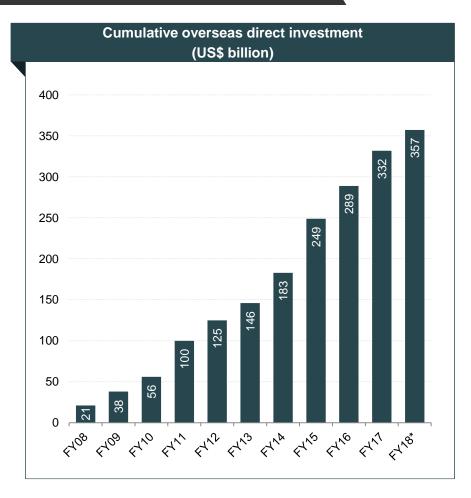


Notes: CAGR - Compound Annual Growth Rate, PPP - Purchasing Power Parity, R&D – Research and Development, E – Estimate, F – Forecast Source: R&D Magazine, International Monetary Fund, World Bank, CIA Fact Book, OECD, Department of Science and Technology

INDIA HAS BEEN EXPANDING ITS INVESTMENT HORIZON ABROAD



- Cumulative overseas direct investments increased to US\$ 357.3 billion in September 2017 from US\$ 21 billion in FY08, leading to significant amount of technology transfer through industrial acquisitions
- For instance, Lupin's total number of patent filings reached 2,837 in FY17 up from 600 in FY08. In FY17, the company filed 39 formulation patents, 128 API (Active Pharmaceutical Ingredient), 42 in the field of biotech and 103 NDDD patent applications.
- As of January 2017, Indian inventors contributed 658 patents to IBM, to help global software giant top the list for US patent recipients in 2016. IBM filed a total of 8,088 US patents, followed by Samsung Electronics in the 2nd position, with 5,518 patents.

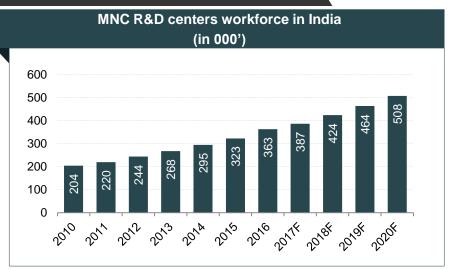


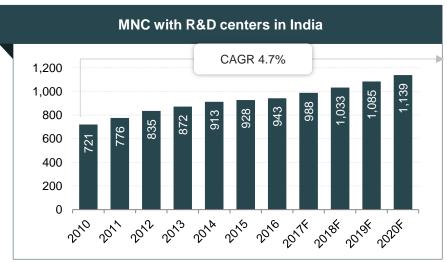
Notes: NDDD – Novel Drug Discovery and Development, FY18* - Up to September 2017 Source: Reserve Bank of India, Department Of Industrial Policy and Promotion (DIPP)

INDIA IS FAST EMERGING AS A GLOBAL R&D HUB ... (1/2)



- The number of MNC R&D centers in India has grown at a CAGR of 7.1 per cent from 721 in 2010 to 1165 in 2016.
- During 2010-16, the workforce in MNC R&D centers increased at a CAGR of 8.58 per cent and reached 363,000, which is estimated to further increase to 387,000 by 2017 in India.
- Intex, a modern speakers manufacturing company, is looking to step up research spend to introduce the latest generation wireless and NFC speakers.



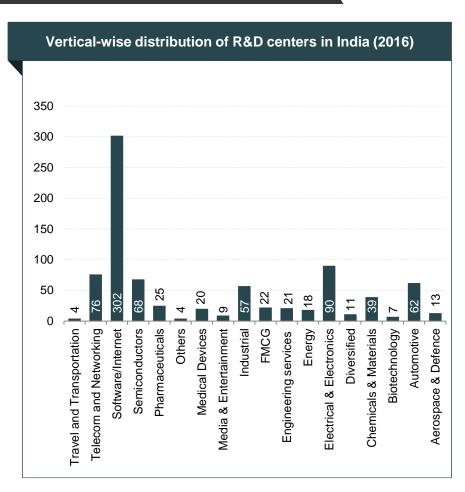


Notes: CAGR - Compound Annual Growth Rate, MNC - Multinational Corporations, R&D - Research and Development, E - Estimate, F - Forecast **Source**: Zinnov Consulting - Crossing the value chasm,

INDIA IS FAST EMERGING AS A GLOBAL R&D HUB ... (2/2)



- Until 2005, Tier-1 cities were the favourite destination for MNCs due to availability of rich talent, favourable policies and better quality of life
- However, post-2005, MNCs have started expanding to Tier-2 cities, as they offer benefits such as higher catchment area, lower attrition and cost arbitrage
- R&D related investments and processes attain easier approval from regulatory authorities, globally. This has also increased focus on new generics
- India's R&D ecosystem has grown at a phenomenal pace in the last 10 years. 42 per cent of the Global 500 R&D Spenders have centers in India, with the figure expected to reach 49 per cent by 2020
- India has emerged as the most preferred destinations for innovation in Asia and the 3rd biggest, globally, with 'Silicon Valley' of East Bengaluru¹ leading the charge.
- India improved its rank on the Global Innovation Index* for the second year consecutively. In 2016, India had climbed from being 81st to being 66th and is now ranked at 60th in 2017.



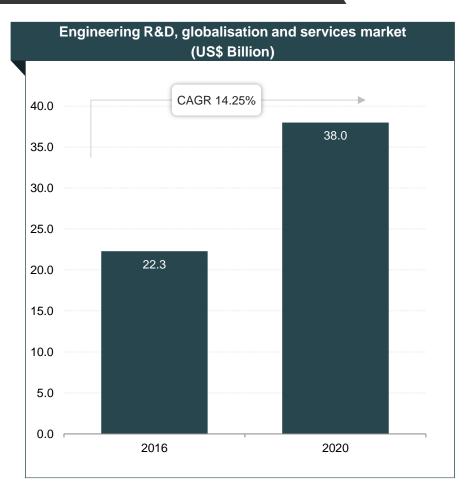
Source: Zinnov Consulting Report 2015, Global Innovation Index* – By World Intellectual Property Organization

Notes: CAGR - Compound Annual Growth Rate, R&D - Research and Development, YoY- Year on Year, 1 – Source from Capegemini

INDIA IS ALSO GARNERING THE BENEFITS OF R&D OUTSOURCING



- Companies across sectors (such as IT, consumer electronics, personal devices, medical electronics, telecom and automobiles) are now offshoring complete product responsibility
- India has become one of the most preferred location for engineering offshoring.
- The engineering R&D, globalisation and services market in India increased 11.5 per cent year-on-year to reach US\$ 22.3 billion in 2016 and is further expected to grow at a CAGR of 14.25 per cent to reach US\$ 38 billion in 2020.
- Newer capabilities such as supply chain, regulatory compliances and manufacturing engineering are being developed by Engineering R&D Service providers
- Service providers in Europe are increasingly looking at scaling up and setting offshore operations in India to access cost effective large talent pool
- In April 2017, India and Russia signed a joint declaration to build an innovation ecosystem between the two countries. The declaration, which was signed between the Science and Technology (S&T) Department of India and the Ministry of Economic Development of the Russian Federation, is expected to promote innovation and technology entrepreneurship through cooperation and direct contacts between Russian and Indian clusters and business associations, techno-parks, business-incubators, high-tech firms, start-up enterprises, educational and research institutions.

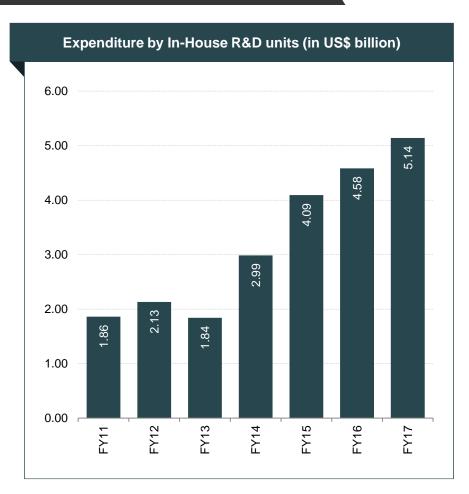


Notes: R&D - Research and Development, T - Information Technology; CAGR - Compound Annual Growth Rate; Figures mentioned are as per latest data available **Source:** Financial Express, Value Notes

GLOBAL 500 COMPANIES PRESENCE IN INDIA



- The top 500 R&D spenders contribute over US\$ 614 billion with the top 100 R&D spenders alone contributing 66 per cent to the global R&D spend
- In India, TVS Motors, Bosch, Tata Motors and Mahindra and Mahindra have topped the list of R&D innovators in the automobile industry. India, being ahead of China, South Korea and Japan, is generating huge opportunities for Indian automobile brands
- As of April 2017, Samsung R&D Institute India filed the maximum number of patent applications in the country's IT sector in 2015-16, followed by TCS and Wipro.
- In May 2017, Tata Group announced that the group has displayed more than 3,300 implemented innovations in its annual innovation programme over the last two years. This signals increasing focus of the group towards R&D and new innovations.



Source: Zinnov – Crossing the value chasm

STRONG POLICY SUPPORT CRUCIAL IN DEVELOPING THE SECTOR



Encouraging the private sector

- The benefit of section 10 (23 G) of the IT Act has been extended to financial institutions that provide long-term capital to hospitals with 100 beds or more
- Government is encouraging the PPP model to improve availability of healthcare services and provide healthcare financing

Encouraging investments in rural areas

- The benefit of section 80-IB has been extended to new hospitals with 100 beds or more that are set up in rural areas; such hospitals are entitled to 100 per cent deduction on profits for 5 years
- Under Union Budget 2018-19, government proposed Rs 10,000 crore (US\$ 1.54 billion) fund for NABARD.
- Under Union Budget 2018-19, allocation to micro-irrigation stood at Rs 4,000 crore (US\$ 617.86 million).
- As per Union Budget 2015-16, custom duty on life-saving equipment has been reduced to 5 per cent from 25 per cent and have been exempted from the purview of countervailing duty

Tax incentives

- Import duty on medical equipment has been reduced to 7.5 per cent
- As per Union Budget 2016-17, services provided by National Centre for Cold Chain Development (NCCD) would be exempted from service tax

Incentives in the medical travel industry

Incentives and tax holidays are being offered to hospitals and dispensaries providing health travel facilities

Policy Landscape

- India released a new national Intellectual Property Rights Policy, which seeks to enhance Prime Minister Narendra Modi's - Make in India scheme, by boosting innovation.
- On the occasion of 9th National Intellectual Property Awards Ceremony held in April 2017, the Commerce and Industry Ministry conveyed that it is focusing on making the Intellectual Property Rights policy faster and efficient. Government's focus on increasing IPR awareness in schools pan India by launching IPR awareness campaigns was also highlighted.

Source: Union Budget 2014-15, Union Budget 2015-16, Union Budget 2016-17, Health Ministry, Aranca Research

SCIENTIFIC AND R&D ORGANISATIONS ... (1/2)



Organisation Business description



Council of Scientific and Industrial Research (CSIR)

- CSIR is India's largest R&D organisation, with 38 national laboratories, 39 outreach centers, 3 Innovation Complexes, 5 units, 4600 active scientists supported by about 8000 scientific and technical personnel. On an average, CSIR files about 200 Indian patents and 250 foreign patents per year. About 13.86 per cent of CSIR patents are licensed, a number which is above the global average. It is engaged in scientific industrial R&D for economic, environmental and societal benefits for the country
- Its research areas span across aerospace, biotechnology, chemicals, energy, foods, information dissemination, leather, metals, minerals and manufacturing etc.
- CSIR is ranked at 84th among 4851 institutions worldwide and was the only Indian organisation among the top 100 global institutions in 2014. CSIR filed 225 patents in India and 307 patents abroad in FY17.



Defence Research and Development Organisation (DRDO)

- DRDO is engaged in design and development of weapon systems and equipment in accordance with the requirements of the military services
- DRDO had a network of 50 labs and establishments to carry out research. As of FY17, it has over 7,410 personnel in Defence Research and Development Services (DRDS) and about 17,000 other scientific, technical and supporting personnel. DRDO received 44 patent grants in FY17.
- Its research areas include aeronautics, armaments, combat vehicles, electronics, instrumentation engineering systems, missiles, materials, naval systems, advanced computing, simulation and life sciences. In June 2015, DRDO's ballistics test facility got inaugurated in Ramgarh.



Indian Council of Agricultural Research (ICAR)

- ICAR is one of the largest national agricultural organisations in the world. It consisted of 99 institutes and 53 agricultural universities across India. ICAR has filed 45 patent applications in FY17.
- It is the apex body for coordinating, guiding and managing research and education in agriculture, including horticulture, fisheries and animal sciences in India.

Source: Organisational websites

SCIENTIFIC AND R&D ORGANISATIONS¹ ... (2/2)



Organisation Business description



India Space Research Organisation (ISRO)

- ISRO is engaged in development of space technology and its application to various national tasks, launched Mangalyan successfully in its very 1st attempt2. In FY17, ISRO received 15 patent grants and filed 12 new patent applications
- The organisation has 19 centers across India to pursue R&D activities and ISRO currently has a constellation of 9 communication satellites, 1 meteorological satellite, 10 earth observation satellites and 1 scientific satellite
- Its research areas include communication satellites for television broadcast, telecommunications and meteorological applications and remote sensing satellites for management of natural resources
- On February 15th, 2017, ISRO made history when its PSLV rocket placed 104 satellites into the space in a single mission.
- As of February 2018, ISRO set up 473 Village Resource Centres (VRCs) on a pilot scale, to show the potential of satellite technology for development of rural areas.



Indian Council of Medical Research (ICMR)

- ICMR is the apex body in India for the formulation, coordination and promotion of biomedical research and one of the oldest medical research bodies in the world. ICMR has filed 10 patent applications in 2016.
- The council has a fleet of 21 institutes (mission oriented national institute), 6 regional medical research centres and 5 units engaged in medical research
- The council's research priorities encompass the areas of communicable diseases, fertility control, maternal and child health, nutritional disorders and non-communicable diseases such as cancer, cardio-vascular diseases, blindness and diabetes



Centre for Development of Advanced Computing (C-DAC)

- C-DAC is a premier R&D organisation of the Department of Information Technology (DIT)
- It is engaged in research in the areas of supercomputers, applied electronics, technology, applications and health informatics
- C-DAC filed 20 patent applications in FY16[^]

Note: R&D - Research and Development, 1 - This list is indicative, 2 - as on 24 September 2014

^ - Figures mentioned are as per latest data available Source: Organisational websites, Aranca Research

INSTITUTES AND UNIVERSITIES



Organisation

Business description



Indian Institutes of Technology (IITs)

- · It is a group of autonomous engineering and technology oriented institutes of higher education
- Indian Institutes of Technology (IITs) is planning to monetise intellectual properties (IPs) by exploring tie-ups with firms that invest in "inventions". In FY17, IITs filed 141 patent applications.



National Dairy Research Institute (NDRI)

- NDRI is engaged in research, teaching and extension activities in areas of dairy production, processing, management and human resource development
- Its research activities focus on improving dairy productivity, innovating milk processing technologies and disseminating information to the various stakeholders in dairy business to make dairying a self-sustaining business
- In FY17, R&D activities comprised 76 in-house and 63 externally funded research projects. In FY17 NDRI filed two patents and three patents were granted.



Indian Institute of Science (IISc)

- IISc is one of the earliest instances of PPP for a research institute in India
- It is engaged in research in various departments of science such as biological, chemical, electrical, mathematical, physical and mechanical sciences. A new center for Brain Research is expected to contribute to future growth
- The number of filed patents increased to 44 during 2016.

Notes: R&D - Research and Development, IP - Intellectual Property, ^ - Figures mentioned are as per latest data available

Source: Organisational websites, IP India, Aranca Research

PRIVATE SECTOR COMPANIES



Organisation Business description



Hindustan Unilever Limited

- HUL is credited with innovations in product areas such as structured bar soap, fairness cream, zero alcohol soap, polycoated scouring bar for dishwashing, fortified salt, instant tea, critical components for a water purifying device, and valueadded (nature care) tea
- · Worldwide, HUL has over 20,000 registered patents and patent applications
- HUL expenditure on scientific R&D is around US\$ 4.6 million in FY17, where the total revenue expenditure is US\$ 4.3 million and US\$ 0.31 million expenditure made as a capital expenditure



Tata Steel Limited

- Tata Steel undertakes research in areas such as raw materials and coke, iron and ferro alloys, steel making, coated products, materials characterisation and joining, materials modelling and product design and refractory technology
- The total value of the patent and trademark is around US\$ 0.3 million, as on FY17.
- The cumulative patents filed till FY17 were 870 and 360 patents were granted as on FY17.



Cipla Limited

- Cipla's R&D division focuses on new product development and new drug delivery systems across a range of therapies
- The company's total R&D spending increased and reached US\$ 159.96 million in FY17.
- In FY17, new filings in the formulations segment stood at 32 ANDAs for North America, 9 filings for South Africa, 700+ filings for emerging markets in addition to 900+ renewals.
- It is among the top companies domestically in R&D spending

Notes: R&D - Research and Development, Growth, 1 - This list is indicative, ANDA - Abbreviated New Drug Application

Source: Organisational websites

Porter's Five Force Framework Analysis



Threat of Substitutes



 With easy access to talent base and low operational costs, companies may look to set up in-house scientific research centres

Bargaining Power of Suppliers

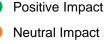


 Contract or academic research centres do not have any direct influence on the market, and have little bargaining power for the commercialisation of technologies developed

Competitive Rivalry

- Competitive rivalry is low; however, there is indirect competition between contract scientific research centres due to development needs of their clients that operate in the same market and are in direct competition with each other
- Many foreign companies tend to set up their in-house research centres that may operate in competition with contract R&D centres





Negative Impact

Threat of New Entrants



The threat of new entrants is low because of the capital intensive nature of the business

Bargaining Power of Customers



 There is no direct influence of consumers. on scientific research; however, technologies are developed keeping consumer needs in mind





STRONG POLICY FRAMEWORK TO PROMOTE INDIA AS A R&D HUB



Policy support Strengthening capacity for basic research

> Strengthening institutional capacity for research

Strengthening human capacity for research Resulting in

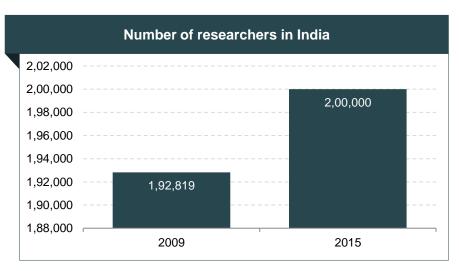
In FY17 leading pharma players spent US\$ 1.24 billion on R&D activities, registering a growth of about 6 times in comparison with 2009-10.

Notes: R&D - Research and Development Source: ICRA, Deloitte, PWC, Aranca Research

STRENGTHENING HUMAN CAPACITIES FOR GROWTH



- In recent years, the Indian Government has implemented several fellowship schemes to nurture human capacity for advanced research in the country.
- The period between 2010-20E has been declared as the "Decade of Innovation" by the nation and the need for the establishment of National Innovation Council has been emphasised. To fuel the growth innovation in science and technology STI (Science, Technology and Innovation) Policy 2013 was formed.
- In 2008, Government launched Innovation in Science Pursuit for Inspired Research (INSPIRE) scheme, through which the Government awarded 2,150 research fellowships for doctoral research and 270 faculty awards for post doctoral researchers
- In December 2016, India and Israel announced plans to support R&D programmes in science and technology sector, with an investment of US\$ 1 million, by both nations.
- The number of Indian scientists coming back to India to undertake research opportunities has risen from 243 between 2007-12 to 649 between 2012-17.
- The number of students enrolled in PhD programmes in India has increased over the years, with 126,451 PhD enrolments in 2015-16, backed by concerted efforts by the Government of India such as increase in the number and quantum of fellowships like the Prime Minister Research Fellowships at the IITs.





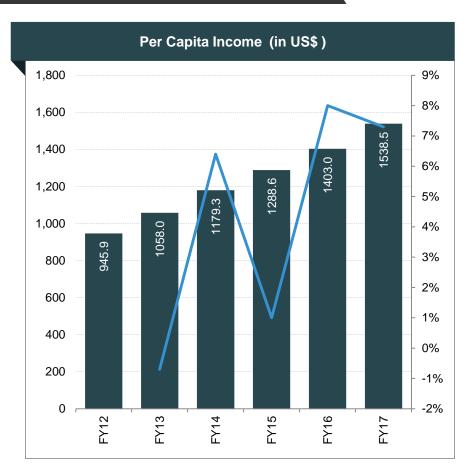
Notes: Pursuit for Inspired Research (INSPIRE), ¹Upto November 2016, ^ - Figures mentioned are as per latest data available

Source: NSTMIS, Department of Science and Technology

LOCAL DEMAND ATTRACTING INVESTMENTS FROM MNCs ... (1/2)



- India presents a unique opportunity for companies manufacturing technologically advanced products, registering per capita income of US\$ 1,538.5 in FY17.
- An expanding middle class and rise in purchasing power of rural residents have boosted demand for innovation and development of cheap and durable products that could meet the local requirements.
- Rising per capita income in India to bring boom in R&D investments in the country with more and more of foreign players shifting R&D bases to India.
- As of December 23, 2016, Maruti Suzuki announced plans to invest US\$ 305.53 million, during 2017-2019, in its R&D center in Rohtak, Haryana.
- Qualcomm, plans to invest US\$8.5 million on design initiatives in India, which would include funding its innovation labs at Hyderabad and Bangalore, for R&D.
- In May 2017, Apple Inc is looking to expand its contract manufacturer's facility and set up new plants in Bengaluru, India, as the iPhone wants to get a larger share of the market.



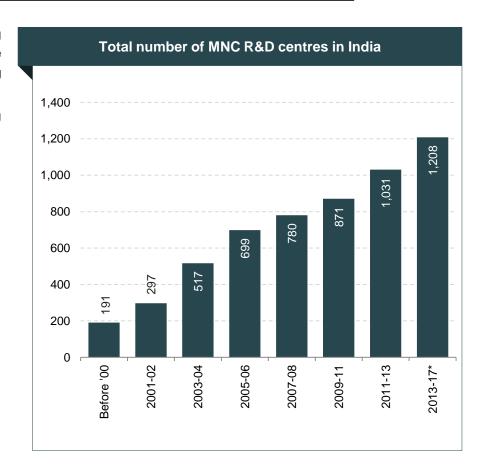
Note: E- Estimates, F - Forecast

Source: IMF, World Bank, India Budget, Government of India Press Information Bureau Government of India, Ministry of Statistics and Programme Implementation

LOCAL DEMAND ATTRACTING INVESTMENTS FROM MNCs ... (2/2)



- Lower development cost, rising technology intensity and growing local demand for top of the line unique technology products have attracted R&D investments from foreign companies in India, making it one of the largest outsourcing provider in R&D segment
- About 28 per cent companies with headquarters in Japan, the EU and APAC have R&D centres in India



Notes: Figures mentioned are as per latest data available; *As of Feb 2017 **Source:** FICCI, Department of Science and Technology, Zinnov, Aranca Research

FAVOURABLE POLICY MEASURES AIDING GROWTH



Science Technology and Innovation Policy 2013

The key elements of the STI policy are:

- Developing synergies between science, technology and innovation
- Providing a fresh perspective on innovation in an Indian context
- Charting a high-technology path for creating a science, research and innovation system in India
- Promoting proliferation of scientific temper among all sections of the society
- Enhancing skill for applications of science among the young from all social strata
- Making careers in science, research and innovation attractive to the brightest students
- Establishing world class R&D infrastructure for gaining global leadership in some select frontier areas of science
- Positioning India among the top 5 global scientific powers by 2020
- Encouraging private sector to invest in research and development in Science and Technology.
- Setting up of large scale R&D facilities via PPP mode.
- Setting up of regulatory framework for sharing IPRs between inventors and investors.
- Migrating R&D outputs into commercial applications by replicating hitherto successful models as well as establishing new structures
- Facilitating S&T-based high-risk innovations through new mechanisms
- Triggering changes in the mind-set and value systems to recognise, respect and reward performances that create wealth from S&T derived knowledge
- Increasing R&D spending to 2.4 per cent of GDP by 2034

Source: News articles, Science and Technology Policy 2013

KEY GOVERNMENT INITIATIVES...(1/2)



The Government of India has taken various steps to generate interest and promote investments in the Science and Technology sector

National Knowledge Network

 A state-of-the-art multi-gigabit (multiples of 10 Gbps) pan-India network is planned to link some 5,000 nodes in India. It will be the sole vehicle for international connectivity in future

National Innovation Council

 2010–2020 has been declared the Decade of Innovation to stimulate innovations and produce solutions for societal needs such as healthcare, energy, infrastructure, water and transportation

Improving Academia

- Innovation universities would be set up as public private partnerships to develop new hubs of education,
 research and innovation
- The Educational market in India has the potential of reaching US\$ 180 billion by FY20 with the increasing demand for quality education.

Prime Minister Research Fellows (PMRF)

In February 2018, the Union Cabinet has approved implementation of 'Prime Minister Research Fellows (PMRF)' scheme, which will promote the mission of development through innovation, at a total cost of Rs 1,650 crore (US\$ 245.94 million) for a period of seven years beginning 2018-19.

High Performance Computer (HPC) System called 'Mihir'

In January 2018, the High Performance Computer (HPC) System called 'Mihir' was inaugurated at the National Centre for Medium Range Weather Forecasting (NCMRWF) at Noida, which is expected to improve India's capacity at weather forecasting.

Source: Department of Science and Technology, Government of India, and Other Government websites

KEY GOVERNMENT INITIATIVES...(2/2)



The Government of India has taken various steps to generate interest and promote investments in science and technology sector

National Council for Science and Technology Communication (NCSTC)

Key focal points include:

- Aims at promoting scientific thinking.
- Communicating science and technology to masses using digital media, folk media and digital media.
- Focus on training in science and technology communication, incentive programmes, production and dissemination of S and T software, development and research in S&T.
- Important initiatives under NCSTC include Mathematics Awareness Resources and Initiatives (MARI), campaigns over Year of Scientific Awareness, the National Science Day, the National Children's Science Congress, Science Express, etc.

Big Data Initiative (2016)

Nano Mission

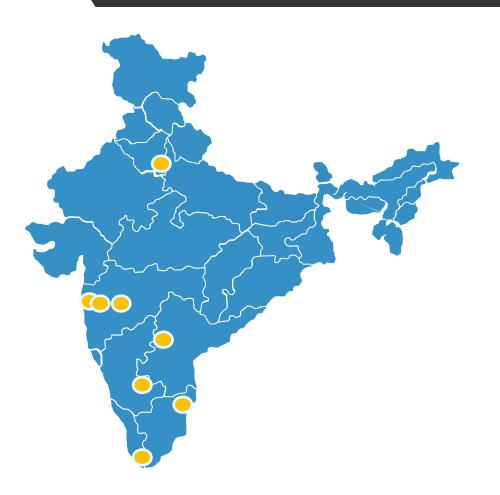
- An innovative R&D perspective to promote big data science, technology and applications within the country.
- Aims at developing core generic technologies, tools and algorithms for wide applications in industries, government and academia.
- Extraction of useful knowledge hidden in in-size data repositories.
- Understanding the current status of industry in terms of policy framework, distinct players providing services across sectors, market size, SWOT of industry, etc.
- Launched as a major "umbrella capacity-building programme"
- Aimed at development of infrastructure for nano science and technology research
- Process of laying down a Roadmap for Regulatory Framework for Nanotechnology in India has been initiated
- The number of projects funded under the mission has increased from 38 in FY15 to 56 in FY16 to 67 in FY17.

Source: News articles, Government websites, swissnex India

Science and Technology

INDIA AS CENTRE OF EXCELLENCE





- In FY2017, Indian Institute of Science, Bengaluru has been acknowledged as India's leading science institution.
- As of November 2016, Ministry of Earth Sciences, Government of India and Japan Agency for Marine-Earth Science and Technology (JAMSTEC) have signed a Memorandum of Understanding (MoU) for advancement of academic research in the field of Earth Sciences
- As on November 2016, India has become an associate member at European Organisation for Nuclear Research (CERN)

Notes: (1) Centre of Excellence are identified using a threshold of minimum of 200 research papers in the top decile of global research (2014); As per Latest Data available **Source:** swissnex India, NSTMIS

POLICY SUPPORT AIDING GROWTH IN THE SECTOR



PPP in R&D

Exchange of scientific knowledge between research centers, national laboratories, institutes of higher learning and the industry

The Indian Government plans to involve the private sector in R&D mainly for sectors like vaccines, drugs and pharmaceuticals, super computing, solar energy and electronic hardware. The govt. has announced to create a US\$ 16 million fund for setting up R&D units with the help of industries

The government has created a US\$ 1.1 billion public-private partnership fund to support R&D in India

Funded institutions and foreign universities

Government has announced to set up five new All India Institute of Medical Sciences in Jammu and Kashmir,
 Punjab, Tamil Nadu, Himachal Pradesh, Assam and set up of IIT in Karnataka and Dhanbad

Foreign universities permitted to enter the higher education system in India by establishing their own campuses or joint ventures with existing universities

 Atal Innovation Mission with US\$ 24.84 million will boost the academicians, Entrepreneurs and researchers to work towards innovation

Union Budget 2018-19

- The allocation to the Department of Science and Technology (DST) has been increased by 8.21 per cent to Rs 5,114.78 crore (US\$ 790.05 million) as against the previous budget.
- The budget for the Ministry of Science and Technology, has been increased by 6.11 per cent to Rs 12,322.28 crore (US\$ 1.9 billion) as against the previous budget.
- The Department of Atomic Energy has been allocated Rs 13,971.41 crore (US\$ 2.16 billion), an increase of 5.76 per cent against the previous budget.
- The Ministry of Earth Sciences was allocated Rs 1,800 crore (US\$ 278.04 million), which is an increase of 12.66 per cent as against the previous budget.

Note: PPP - Public Private Partnership

Source: Battelle, Electronics for You, Union Budget 2015-16, Organisational websites





OPPORTUNITIES

R&D OPPORTUNITIES IN VARIOUS SUB SECTORS IN INDIA



ICT and wireless technology

- Establishment of Software Technology Parks of India (STPI'S)
- National Policy of IT aims at bringing the power of ICT within the reach of all its citizens to enable India to emerge as a global hub for IT by 2020
- Cloud computing presents endless opportunities in wireless technologies

Pharmaceuticals and Health Care

- 3rd largest pharmaceuticals market by 2020
- US\$ 55 billion in revenues by 2020 and US\$ 26.1 billion in genetics in 2016
- A new Health Policy 2015-2025 to focus on healthcare for all holistically

Manufacturing technologies

- Automation and environmental sustainability are the key focus areas for manufacturing companies
- The National Manufacturing Policy targets at creating 100 million additional jobs in the sector by 2025
- Planned expenditure in R&D in manufacturing sector increased by 63 per cent in 2016-17 as compared with that in 2015-2016

Material energy

 Multi-disciplinary research to combine emerging concepts in nanotechnology with fundamental metallurgical chemistry is the way forward

Bio-energy

- Bio-energy is emerging as a promising alternative to meet rural energy needs in India
- Targets set by Bioenergy Programme: By 2020, 20 per cent blending of fossil fuels will be done, cost effective production system for algal biofuel, next generation biofuels produced from agricultural waste

Water technologies

- The water demand of industry will account for 8.5 per cent and 10.1 per cent of the total fresh water abstraction in 2025 and 2050 respectively
- R&D efforts should concentrate on developing technologies for treatment, recycling, recovery, reuse and efficient use of water

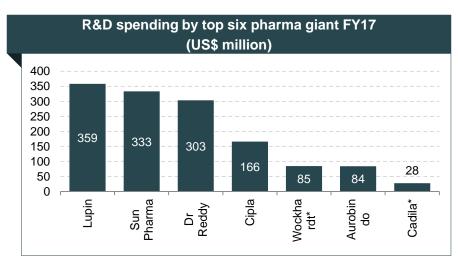
Source: Make In India, FICCI

RISING R&D ACTIVITIES IN THE INDIAN PHARMACEUTICAL SECTOR



- Indian pharmaceutical market is expected to expand at a CAGR of 18.89 per cent during 2016-2020
- Key drivers that will fuel the sector's growth include rising income levels, increase in chronic diseases, better medical infrastructure, wider health insurance reach and supportive healthcare policies
- Creation of new drug testing laboratories and further strengthening of 31 existing state laboratories
- A weighted tax deduction is given under section 35(2AA) of the Income Tax Act
- Allocation of US\$ 364.96 million to set up four more institutions of the stature of AIIMS in J&K, Punjab, Tamil Nadu, Himachal Pradesh and Assam. Another AIIMS to be set up in Bihar
- Setting up of projects in special areas such as the North-East,
 Jammu and Kashmir, Himachal Pradesh and Uttarakhand
- Companies need to develop drugs for diseases local to India and other tropical countries
- Overall R&D expense by Indian companies has been around 5 per cent of sales and is expected to increase in coming years
- Investment expenditure on healthcare cloud-based platform is forecasted to rise to an estimated US\$ 9.5 billion by 2020.





Notes: : F denotes Forecasted, *: For FY16

Source: Make in India, FICCI, Ministry of Chemicals and Fertilizers- Department of Pharmaceuticals, Aranca Research

THE WAY FORWARD ... (1/2)



India Innovation Growth Programme

- The aim is to accelerate innovative Indian technologies into the global market
- This programme is a joint initiative of FICCI, Dept. of Science and Technology, Govt. of India and others
- The Government's focus is on using the world class commercialisation strategies and business development assistance to expand in the global market

Human capital development

- Special incentive mechanisms are being developed to stimulate research in universities and develop young leaders in science and engineering
- The policy framework is being devised to enable school science education reforms, by improving teaching methods and science curricula

Investment to promote Research

- Government is promoting investments in basic research to improve research quality to meet global standards and to address national challenges
- Leveraging international S&T co-operation, the government has planned co-investment of resources for joint initiatives with Australia, Canada, Germany, etc.
- The government has its focus on investing in R&D of technologies that address the needs of rural India
- In April 2017, a joint declaration was signed between National Science and Technology Entrepreneurship
 Development Board and the Ministry of Economic Development of the Russian Federation to build an
 innovation ecosystem to promote technology entrepreneurship
- As of August 2017, the Government has sanctioned US\$ 1.39 billion for ISRO to build and launch 31 rockets in the next three to four years

Attracting investment from private sector

- Through Science, Technology and Innovation Policy, the Government is promoting the establishment of large R&D facilities in PPP mode with provisions for benefits sharing
- Promoting multi-stakeholder participation in the Indian R&D system
- As per recent RBI (Reserve Bank of India) norms, start-ups can now access foreign currency loans of up to US\$3 million in a year, under the External Commercial Borrowing (ECB) route

Source: Science, Technology and Innovation Policy 2013; Department of Science and Technology

THE WAY FORWARD (CONTD.) ... (2/2)



Recent Developments

• Two separate spacecrafts, Indian Space Research Organisation's (ISRO) Chandrayaan-2 and India's first private moonshot Team Indus, are to be launched to the moon between November 2017 and March 2018.

Promoting innovation

- Through Science, Technology and Innovation policy, the Government promotes mechanisms for nurturing technology business incubators and science led entrepreneurship
- Also promoting incentives for commercialisation of innovations with focus on green manufacturing
- In April 2017, the President of India presented the National Geo-science Awards 2016. Since the past 5 decades, these awards have emerged as the most coveted recognition in the field of geo-sciences and they have encouraged scientists to achieve higher levels of excellence
- As of May 2017, more than thousand scientists have returned to the country on various scholarships and fellowships, to promote research and development activities in various fields. Fellowships like VAJRA (Visiting Advanced Joint Research), launched in January 2017, have been successful in attracting overseas scientists and academicians, especially NRIs.
- As of July 2017, a five year technology fund with US\$ 4 million yearly investment, called Israel India Innovation Initiative Fund (I4F), has been launched by India and Israel to boost bilateral ties.
- The Government of India is extensively promoting research parks technology business incubators (TBIs) and (RPs) which would promote the innovative ideas till they become commercial ventures.

Attracting investment from private sector

- The Indian Institute of Science Education and Research (IISER), which served as a part of a global team of scientists, proposed to set up a LIGO (Laser Interferometer Gravitational Wave Observatory) detector in India. LIGO will help in detection and observation of gravitational waves.
- GridRaster Inc, working in the virtual and augmented reality space, has raised US\$ 2 million as seed funding, which will be used for marketing and product development.

Source: Science, Technology and Innovation Policy 2013, News Aricles



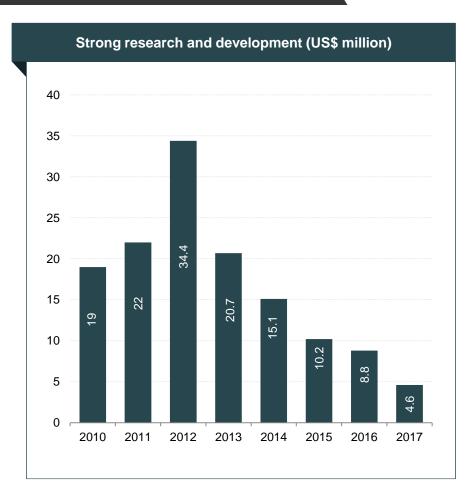


CASE STUDIES

HUL: A LEADING INNOVATOR IN FMCG



- Incorporated in 1933, HUL is India's leading company by sales in the Fast-Moving Consumer Goods (FMCG) sector in India. British-Dutch company Unilever owns a majority stake of 52 per cent in HUL
- HUL has won the top FMCG award at the Dun and Bradstreet Corporate Awards 2015
- Hindustan Unilever Ltd. (HUL) has been ranked No. 31 in India on the Forbes list of Most Innovative Companies across the globe for 2016¹.
- The company has over 20,000 registered patents and patent applications worldwide
- HUL is also driving innovation in various categories such as oral care, personal products and soaps and detergents etc.



Notes: CAGR: Compound Annual Growth Rate, 2016¹ – Data as on August 2016

Source: Economic Times, Company Annual Reports, Company website

EVOLUTION OF ISRO



- ISRO was formed on August 15, 1969
- First Indian Satellite, Aryabhata, was launched on April 19, 1975

- First operational Indian Remote Sensing satellite, IRS-1A, was launched on March 17th, 1988.
- On December 28th, 1995, third operational Indian Remote Sensing Satellite, IRS-1C, was launched.
- The third developmental launch of PSLV with IRS-P3 took place on March 21, 1996 and the satellite placed in Polar Sun Synchronous Orbit.
- Ten satellites on April 28, 2008 and eight Nano Satellites for International Customers, under a commercial contract with Antrix Corporation, were launched.
- India's first Radar Imaging Satellite (RISAT-1) from Sriharikota was launched on April 26, 2012.



- On July 18, 1980, Rohini satellite was successfully placed in orbit in second experimental launch.
- In April 1984, Indo-Soviet manned space mission.
- Indian Remote Sensing Satellite, IRS-P4, was launched by Polar Satellite Launch Vehicle along with Korean KITSAT-3 and German DLR-TUBSAT, on May 26, 1999.
- On January 10, 2007, four satellites were launched successfully – India's Cartosat-2 and Space Capsule Recovery Experiment as well as Indonesia's LAPAN-TUBSAT and Argentina's PEHUENSAT-1.
- Mars Orbiter Mission, the India's first interplanetary mission to planet Mars, was successfully launched on November 05, 2013.
- India's Mars Orbiter Spacecraft successfully entered into an orbit around planet Mars on September 24, 2014.
- ISRO made history on February 15th, 2017 when its PSLV rocket placed 104 satellites into the space in a single mission.
- ISRO is planning to launch 30 satellites in a single mission on board its PSLV in December 2017.

Notes(1): CAGR - Compound Annual Growth Rate

Source: World Steel Association (WSA), DIPP, DataMonitor, Aranca Research





INDUSTRY ORGANISATIONS

INDUSTRY ORGANISATIONS



National Academy of Sciences

Address: 5, Lajpatrai Road, New Katra

Allahabad - 211 002, India Tel: 91- 532- 2640224

Fax: 91- 532- 2641183

Indian Science Congress Association

Address: 14, Dr Biresh Guha Street

Kolkata – 700017, India Tel: 91- 33- 22474530

Fax: 91- 33- 2402551 Email: iscacal@vsnl.net

Indian National Science Academy

Address: Bahadur Shah Zafar Marg,

New Delhi – 110002, India Tel: 91- 11- 23221931

Fax: 91-11-23235648

Email: esoffice@insa.nic.in

Indian National Academy of Engineering

Address: 117 Nalanda House, IIT Campus, Hauz Khas, New Delhi 110 016, India

Tel: 91- 11- 26582475

Fax: 91- 11- 26856635 Email: inae@nda.vsnl.net.in

Indian Academy of Sciences

Address: C. V. Raman Avenue, Post Box No 8005

Sadashivanagar, Bangalore 560 080

Tel: 91- 80- 23612546

Fax: 91-80-23616094

Department of Science and Technology

Address: Technology Bhavan, New Mehrauli Road

New Delhi - 110016, India

Tel: 91- 11- 26567373

Fax: 91- 11- 26864570

Email: dstinfo@nic.in





USEFUL INFORMATION

GLOSSARY



- CAGR: Compound Annual Growth Rate
- FDI: Foreign Direct Investment
- FY: Indian Financial Year (April to March)
 - So FY12 implies April 2011 to March 2012
- GOI: Government of India
- MNC: Multinational Company
- GERD: Gross Expenditure on Research and Development
- STI: Science Technology and Innovation
- Y-o-Y: Year on Year
- INR: Indian Rupee
- US\$: US Dollar
- LCV: Light Commercial Vehicle
- PPP: Public Private Partnership
- Wherever applicable, numbers have been rounded off to the nearest whole number

EXCHANGE RATES



Exchange Rates (Fiscal Year)

Exchange Rates (Calendar Year)

Year INR	INR Equivalent of one US\$	Year	INR Equivalent of one US\$
2004–05	44.81	2005	43.98
2005–06	44.14	2006	45.18
2006–07	45.14		
2007–08	40.27	2007	41.34
2008–09	46.14	2008	43.62
2009–10	47.42	2009	48.42
2010–11	45.62	2010	45.72
2011–12	46.88	0044	40.05
2012–13	54.31	2011	46.85
2013–14	60.28	2012	53.46
2014-15	61.06	2013	58.44
2015-16	65.46	2014	61.03
2016-17	67.09	2015	64.15
Q1 2017-18	64.46	2013	
Q2 2017-18	64.29	2016	67.21
Q3 2017-18	64.74	2017	65.12

Source: Reserve bank of India, Average for the year

DISCLAIMER



India Brand Equity Foundation (IBEF) engaged Aranca to prepare this presentation and the same has been prepared by Aranca in consultation with IBEF.

All rights reserved. All copyright in this presentation and related works is solely and exclusively owned by IBEF. The same may not be reproduced, wholly or in part in any material form (including photocopying or storing it in any medium by electronic means and whether or not transiently or incidentally to some other use of this presentation), modified or in any manner communicated to any third party except with the written approval of IBEF.

This presentation is for information purposes only. While due care has been taken during the compilation of this presentation to ensure that the information is accurate to the best of Aranca and IBEF's knowledge and belief, the content is not to be construed in any manner whatsoever as a substitute for professional advice.

Aranca and IBEF neither recommend nor endorse any specific products or services that may have been mentioned in this presentation and nor do they assume any liability or responsibility for the outcome of decisions taken as a result of any reliance placed on this presentation.

Neither Aranca nor IBEF shall be liable for any direct or indirect damages that may arise due to any act or omission on the part of the user due to any reliance placed or guidance taken from any portion of this presentation.



