

India Becoming Influential in Space Industry

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ABSTRACT - Space business is very upcoming and is rising to be a necessity in the mere future. India has usually focussed on the social welfare aspects of space technologies but recently in order to grow, India is slowly entering into Space Business. Many researchers looked into global space business as a whole, as India still lacks behind a lot of countries like USA, Japan, China, etc. Data in this project is taken from E-Papers, Articles, Journals, etc. after thorough reviews on topics of how ISRO regulates the space industry in India, how start-ups are slowly emerging and what is the investment scenario in the space business in India, performance in the industry and how can India have a competitive edge over others in the future. This paper deals with the current growth of industries in the space business and how India can profit from the current scenario. Usually India is assumed not to be a part of the global space business as its contributions are minimal. On contrary to what has been assumed this paper clearly shows the potential that India has to be a superpower in future. It will take time to grow but if proper regulations are made and if India understands where to invest properly then it might have a competitive edge over others sometime in the future.

Keywords: *Competition, Future, India, Investment, ISRO, Space Industry.*

I. INTRODUCTION

In the coming years space business will be very important. Space business refers to the economic activities of manufacturing components that will orbit Earth or send them into space, delivering them to those regions, and providing associated services. Some sources use the term satellite industry interchangeably with the term space industry/business because of the prominence of satellite-related activities. An individual or company who develops, provides, or leverages space-based products or services is considered to be part of the space economy. This manufacturing chain is composed of many actors, starting with the developers of space hardware and ending with the producers of products and services based on space technology. The space industry is becoming more and more popular as a business venture. Large corporations, medium-sized companies, as well as start-ups are all making a beeline for the final frontier. India's space programme is one of the most effective developing space business in the world and India has many achievements to its credit thanks to its state-owned space agency, the Indian Space Research Organisation (ISRO). Space activities are primarily managed by ISRO in India. Private companies have collaborated with ISRO as suppliers and component manufacturers, but they have never been responsible for the manufacturing of spacecraft from scratch. India has a naturally strong interest in the areas of aerospace, defence, and aeronautics.

II. LITERATURE REVIEW

In this paper, the null hypothesis is based solely on the question of whether India can challenge the space industry. Space is now viewed as a commercial enterprise more than

ever before. Whether big, medium, or small, businesses are all focused on the final frontier.

Increasing competition for commercial launches has contributed to the reduction in launch costs. This competition has led to lower launch costs for satellites into space and made possible the expansion of space-based Internet services using thousands of satellites in the future.

As mentioned by Morgan Stanley in their research paper on July 24, 2020, Humans left footprints on the moon nearly half a century ago, and since then manned missions to low-Earth orbit and unmanned scientific exploration have been the mainstay of human space exploration. Now, high levels of private funding, technological breakthroughs, and public interest in space are reviving the creative spirit.

Antrix Corporation Limited an Indian government-owned company under the administrative control of the Department of Space states that, since the turn of the century, the commercial space sector has grown at an unprecedented rate. In the last decade, commercial space services have been greatly reduced in cost due to increased capacity in the space services (like telecommunications and imaging from space) across the globe. In order to ensure that space remains a major growth engine, issues like having a conducive environment, reducing the cost of access to space, and incorporating space technology throughout the globe to benefit individuals and small communities need to be addressed. Since INSATs, IRS series, and Chandrayaan-1 have been successfully launched by the Indian Space Research Organization (ISRO), many opportunities have arisen for the Indian Space Industry. Chandrayaan 2 is the next space mission to be launched by ISRO, which will mark

further growth. Indian officials have shown a promising intent to compete seriously in the space market.

Arun Rao in an E-Paper by Economic times lets us know about India's evolution by stating ISRO's space research centers - Vikram Sarabhai Space Centre, Space Applications Centre, and other centers played a key role in harnessing this momentous growth - from relying on foreign countries for space programs to now launching its own launch vehicles.

PWC in one of their research reports mentions India's main aim that is, "Globally, the space economy is valued at USD 360 billion. Around 2% of the global space economy is accounted for by the Indian space economy, which is valued at USD 7 billion. Against the target of USD 50 billion, the Indian space sector must grow at a rate of about 48% CAGR over the next five years."

An article on Financial Express states how India opens space sector to private players: What it means for ISRO. In order for a space industry to grow, private players must be involved.

An article on The Hindu by Rakesh Sood also talks about India's thrust areas of satellites the introduction of start-ups and requirement of proper legislations to help Indian space industry to grow more. And an article by M. Somashekhar on The Hindu Business Line mentions ISRO: Talking about how ISRO helps poor fishermen by using its satellites for social welfare, as well as how India is becoming a space power.

An article on mint by Chaitanya Giri talks about how India's space industry recently saw the involvement of private companies and start-ups. The government wants to create a market-driven space industry.

As far as we know, India's progress depends on the implementation of appropriate investments and legislative regulations. No doubt, India plays a very significant role in the Indian space industry, but in order to grow and gain a competitive edge over its competitors it needs to compete with other global space organisations.

III. RESEARCH METHODOLOGY

We can understand the methodology better after reading this chapter because the research is completely based on secondary data.

There are two techniques used here, qualitative data and quantitative data. Data that approximates and describes are classified as qualitative data. It is possible to observe and record qualitative information. This data type is non-numerical in nature. This research is done after thorough reviews of E-Papers, Articles, Journals, etc. In quantitative analysis, each set of data has a numeric value, which gives each data-set its own unique identity. Statistical analysis can be used to gain insight into the likelihood of occurrence of events based on mathematical derivations, such that real-life

decisions can be based on these derivations. We have taken into consideration numerical data from an article of Morgan Stanley. We have prepared stacked column charts from the absolute values and also have prepared line charts from percentage comparison of the data. Column chart is also used in this paper for differentiating the use of fixed access to consumer broadbands in some of the major countries in relation to India This research serves the purpose of better understanding how India currently performs in the Space business segment and where it needs to invest to be competitive.

IV. DATA ANALYSIS

As soon as Sputnik 1 was launched in 1957, the space race was well underway, and for the next half-century ever larger and more expensive satellites built to last 40 years were launched. Despite this, space was reserved for government-dependent corporations.

Today's scenario has fundamentally changed: companies needing space to achieve their goals and expand their services are able to gain a foothold in this area by establishing small, fast and affordable systems. Many startups are benefiting from the new nanosatellite constellations due to the savings involved.

In order to support the nanosatellite revolution, we need a completely new production environment, using stations, satellite control software, specialized subsystems, solar panels, batteries, rockets, and other technologies.

Today, space is viewed more as a business enterprise than ever before. All types of businesses are heading for the final frontier, from the large to the medium to the start-up

A 'New Space' implies an 'Old Space' whose potential was underdeveloped due to time and funding issues. Three key concepts shape business opportunities in this 'New Space':

- Flexible methodologies
- Short development
- Lower price

Satellite manufacturing, the manufacturing of ground support equipment, and launch services make up the three major sectors of the space industry. There are satellite and subsystem manufacturers in the satellite manufacturing sector. In the ground equipment sector, manufacturers sell items such as mobile terminals, gateways, control stations, VSAT systems, satellite dishes for direct broadcast, and other items. Among the launch sector's components are launch services, vehicle production, and subsystem manufacturing.

There are new actors emerging and business opportunities emerging as a result of the democratization of space. In the same way that the Internet was once the breeding ground for

hundreds of start-ups, the space environment today serves as a backdrop to countless innovative ideas.

Space is being used by large companies as well as startups to do business on Earth by offering new services or generating data for processing and commercialization.

Through the Indian Space Research Organisation (ISRO), India's state-owned space agency, the country's space programme is one of the most successful in the world. Space activities are primarily managed by ISRO in India. Private companies have provided ISRO with components and equipment as suppliers, but they have never been entrusted with the responsibility for end-to-end manufacturing.

Bengaluru is the seat of the Indian Space Research Organisation, the nation's national space agency. ISRO is operated by the Department of Space (DOS), which reports directly to the Prime Minister of India, and the chairman of ISRO serves in the role of executive director of DOS. It is India's primary agency to conduct space related tasks, including exploring space and developing technologies related to space. In addition to offering launch capabilities, the agency also operates large fleets of artificial satellites and deploys cryogenic engines.

Private companies have been limited in their participation in the Indian space industry due to the lack of attention given to increasing commercial activities. It is true that ground operations like mission support, broadband gateways for satellites and 5G backhubs have huge commercial potential.

Currently, there are 360 billion dollars in the global space economy. Around 2% of the global space economy is accounted for by the Indian space economy, which is valued at USD 7 billion. To achieve its target of USD 50 billion, the space sector in India will need to grow at a CAGR of 48% for the remaining five years.

As a result of India's competitive advantages, such as its high demand for services, its domestic manufacturing capabilities, its low costs, its human resource pool, and its ability to leverage technology, the time is ripe for policymakers to support the expansion of the private space sector.

India has a naturally strong interest in the areas of aerospace, defence, and aeronautics. Several space missions have been carried out elsewhere by brains from India. As part of a recent policy announcement, the government announced an expansion of private participation in space activities, giving private companies an opportunity to participate in satellite launches and space-based services. Furthermore, the Indian National Space Promotion and Authorization Centre (IN-SPACe) was created in consultation with ISRO to assess the needs and demands of private players, including educational and research institutions. In-SPACe will be both a facilitator and a regulator, according to the cabinet statement. Designed to facilitate best resource use, the newly created centre will

serve as a conduit between ISRO and private players. This presents new opportunities for private companies in the fields of satellite technologies, sub-assemblies, electronic components and materials, among others. As a result of space and satellite technology, we are able to make predictions that help us in a variety of industries, from agriculture to weather, communications, military to defence, banking to monitoring and surveillance.

India is now positioned to build an ecosystem in space with ISRO acting as the guiding force, large enterprises diversifying into the sector, and small companies making sub-assemblies. Now that India has start-ups and technology innovators, it can become a space start-up hub for the world. According to industry estimates, there are 40+ start-ups working in India, complementing the government, ISRO, VSSC, and other organizations in the space and satellite industry. Technology will play an important role in increasing this number.

The French and Indian space cooperation vision was completed in 2018. Space technology's various aspects include societal impact, surveillance and assessment of conditions in space, an emphasis on global challenges like climate change, and the development of technologies for human exploration of the universe. India's space economy share could be expanded by collaborating on three key aspects. First, ISRO needs to join forces with industry and entrepreneurs in order to create indigenous missions, such as re-launchable spacecraft and human spaceflight. By bridging the real and virtual worlds, France can help companies expand the boundaries of satellite and rocket innovation, and make space more accessible. A second goal involves bringing in a business platform that can assist in reducing launch time by achieving first-time-right quality for successful launches. By integrating different departments and information, this business platform will allow design and manufacturing to be accelerated and validated virtually while providing digital capabilities. Last but not least, companies must reduce the gap between the virtual and real world and create an effective framework for managing complex systems of systems, in coordination with international space organizations, in order to create innovative satellite launch programs. An advantage of first-to-market can be gained if this can accelerate the product life-cycle.

Public-private partnership (PPP) policies have been adopted by ISRO in recent years in order to encourage companies to take up more production activities. Parts and components for the manufacture of satellites and launch vehicles are supplied by SMEs in India. They are contracted by ISRO to meet its needs. In addition, ISRO has brought together private sector players for assembly, integration, and testing (AIT) of 30–35 satellites.

The space industry is being transformed by the growth of small satellites. Increasing demand for satellite service can also be seen in the need for in-space repairs or upgrades for

satellites in orbit. Increasing demand for nanosats and small satellite constellations has led to a lucrative business in satellite launching.

The venture capital (VC) industry is ready to invest in startup space companies, but the visibility into successful business models is limited. In order to build things in space, one of the greatest challenges is to actually get things into space. The cost and restrictions of manufacturing everything on Earth and then launching it with rockets are prohibitive.

About 65 years ago, satellites were invented, and the world was enthralled by their wonders in space. In a new frontier of satellite technology, companies can now expand the limits of rocketry and satellite innovation collectively, enabling more people to access space. We must bridge the real and virtual worlds to run satellites into space more efficiently and sustainably so we can deploy them into orbit first time right by bridging rocket technology with satellite design, manufacturing and operations. Satellites and launch vehicles are developed by more than 500 companies. Approximately 90 percent of the launch vehicle cost comes from indigenous

Following is the data from Morgan Stanley on the global growth specific industries in the Space segment,

	2015	2016	2017	2018	2019	2020	2021e	2022e	2023e	2024e	2025e
consumer tv	97800	97700	97000	92924	93891	94062	93546	93615	94009	94768	95812
fixed satellite services	17900	17400	17900	17469	17632	17731	17847	17958	18061	18148	18218
ground equipment	106000	113400	119800	125966	131876	137512	142863	147919	152679	157143	161313
non satellite industry	80500	78600	79300	80086	80959	81923	82980	84134	85388	86746	88213
consumer radio	4600	5000	5400	5748	6110	6407	6679	6922	7148	7364	7576
mobile satellite service	3400	3600	4000	5420	5838	6693	9292	7739	8145	8568	8965
satellite manufacturing	16000	13900	15500	19095	9375	18501	22652	25021	26719	27948	28846
consumer broadbands	1900	2000	2100	2177	3891	7349	10932	14506	18167	21919	25764
earth observation service	1800	2000	2200	2422	2669	2944	3250	3592	3972	4397	4872
satellite launch	5400	5500	4600	4884	3164	4293	4996	6027	6913	7668	8305
sum	335300	339100	347800	356191	355405	377415	395037	407433	421201	434669	447884

[Table 1. Showing the Global growth for specific industries in the space business]

This table is providing us with the data on which industry has gained how much growth in the space business as a whole.

We can see here, the timeline from 2015-2025 with data from 2021 being an expected data. This expected data might not be 100% accurate but this is the most trustworthy data that we can get based on the market trends.

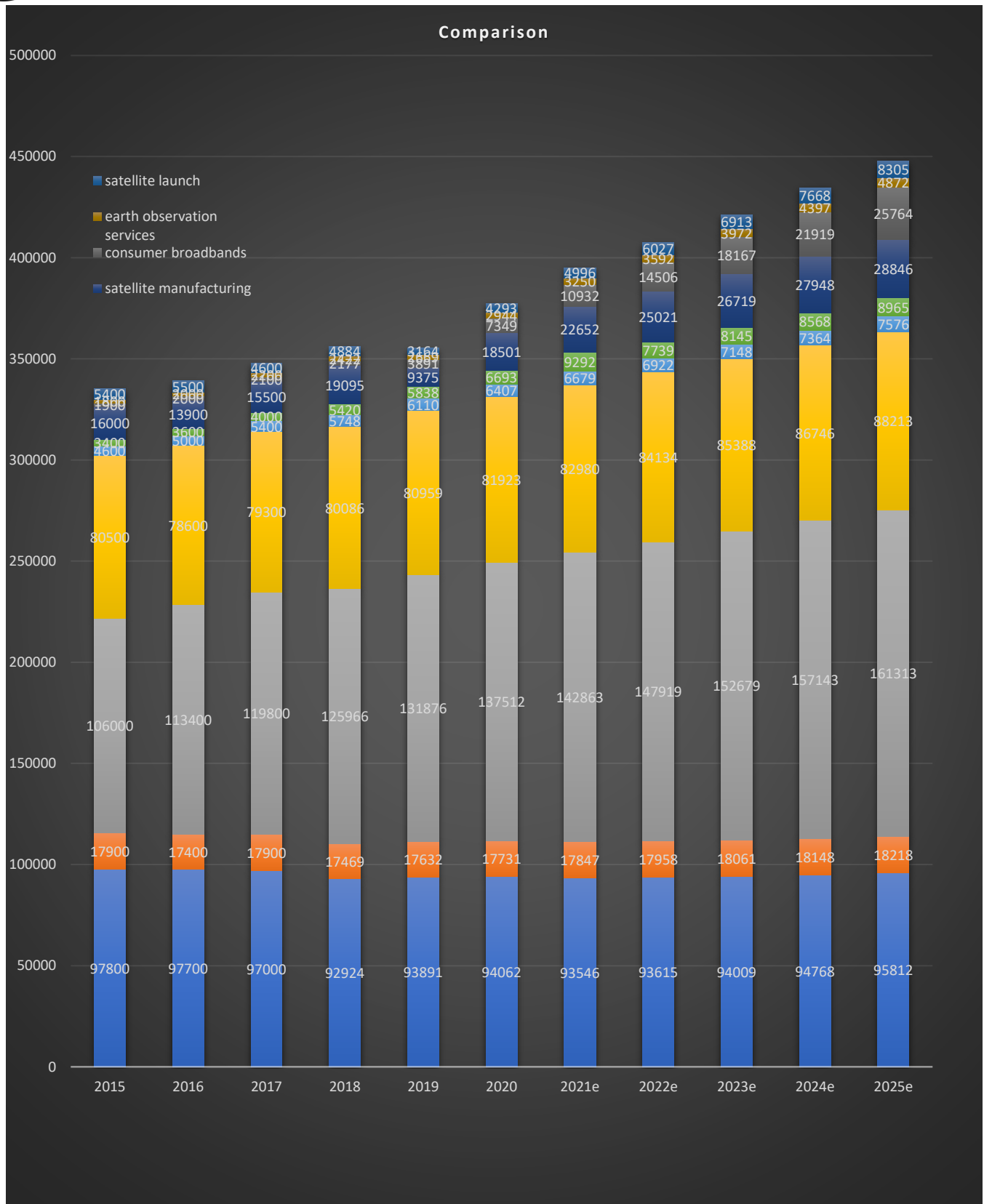
But we are not able to understand from the above table that, what is the rise or the inclination in the industry. For better understanding we need a chart to better demonstrate us the rise in growth.

Hence, we will be using the stacked column chart for better depiction of the data as we will be able to visualise the impact of all the industries. Different colours will represent different industry growth in a particular year. The chart will give us a visually clear picture on the growth of industries.

But that is not it. Further evaluation will be necessary unless and until we get an absolute industry for India to work on to have a competitive edge over the other big names in Global space business.

technology and materials. In the lucrative market for commercial launch vehicles, the PSLV is highly competitive in terms of cost. It has progressed to the point that the domestic industry is now branching out into satellite manufacturing. There are many suppliers and buyers of communication transponders on the global market, with many private and public companies providing these transponders. In this market, there are fewer distortions induced by government.

There is a synergy among New Space startups and government programs such as Digital India, Start-Up India, Skill India and the Smart Cities Initiative. Using the talent pool, innovation competence, and technology know-how, they envision themselves as a data-app builder between the data seller (ISRO/Antrix) and the end-user. New Space startups need a supportive ecosystem, a culture of accelerators, incubators, Venture Capitalists, and mentors that exists in cities such as Bengaluru where most of these start-ups have been sprouting.



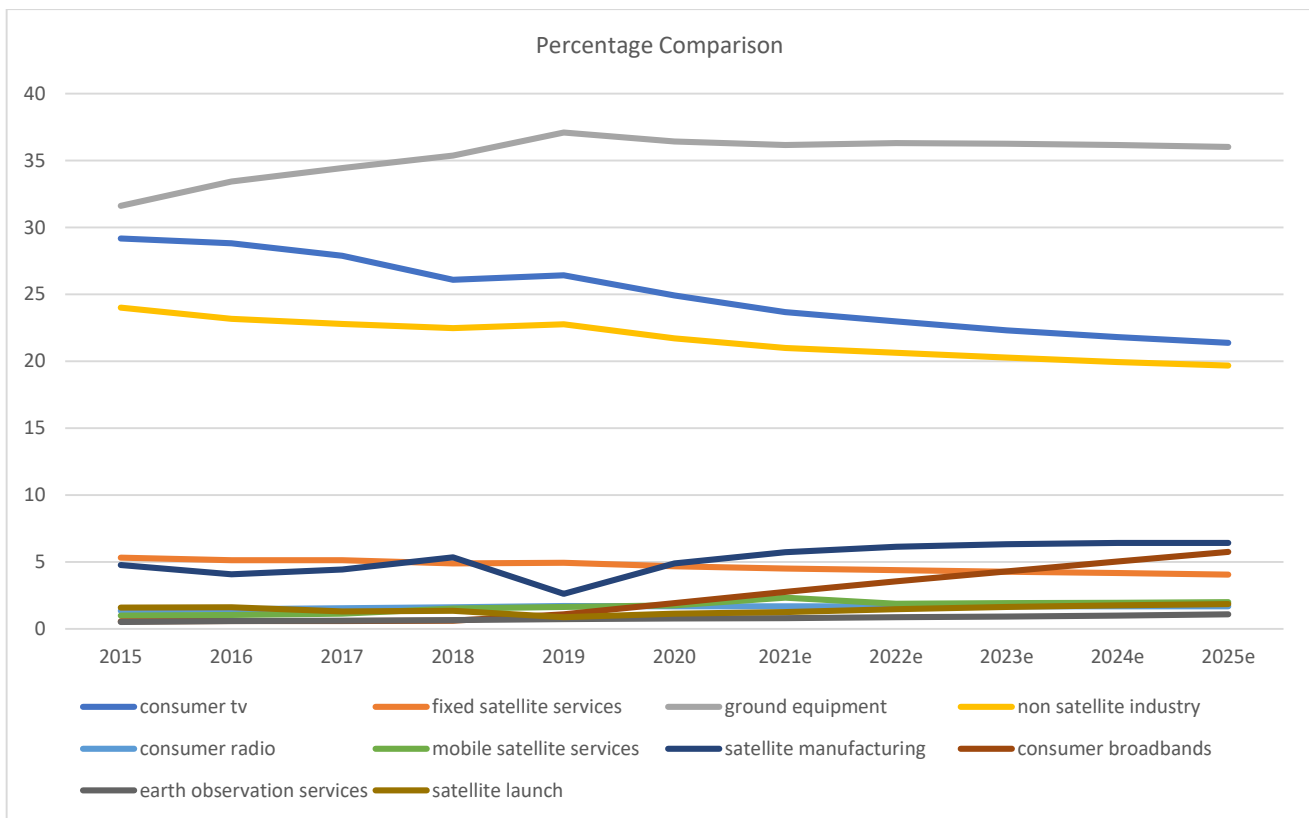
[Chart 1. Showing the Global growth in terms of a stacked column chart]

The above stacked column chart makes it difficult to tell which industry is declining and which one is growing. The column chart shows us clearly which year the rise was seen. We need to bring out the industry which had the most growth in a particular year. Therefore, we did a percentage comparison as shown below,

	2015	2016	2017	2018	2019	2020	2021e	2022e	2023e	2024e	2025e
consumer tv	29.16791	28.81156	27.88959	26.08825	26.41803	24.9227	23.68031	22.97678	22.31927	21.80234	21.39215
fixed satellite services	5.338503	5.13123	5.146636	4.904391	4.961101	4.698011	4.517805	4.407596	4.287977	4.175131	4.067571
ground equipment	31.61348	33.44146	34.44508	35.36473	37.10584	36.43522	36.16446	36.30511	36.24849	36.15234	36.01669
non satellite industry	24.00835	23.179	22.80046	22.484	22.77936	21.70634	21.00563	20.64978	20.27251	19.95679	19.6955
consumer radio	1.371906	1.474491	1.552616	1.613741	1.719165	1.697601	1.690728	1.69893	1.697052	1.694163	1.691509
mobile satellite service:	1.014017	1.061634	1.150086	1.521656	1.642633	1.773379	2.352185	1.899453	1.933756	1.971155	2.001634
satellite manufacturing	4.771846	4.099086	4.456584	5.360888	2.637836	4.902031	5.734146	6.141132	6.343527	6.42972	6.440507
consumer broadbands	0.566657	0.589797	0.603795	0.611189	1.094807	1.947193	2.767336	3.56034	4.313143	5.042688	5.752382
earth observation servi	0.536833	0.589797	0.632547	0.679972	0.750974	0.780043	0.822708	0.881617	0.943018	1.011574	1.087782
satellite launch	1.610498	1.62194	1.322599	1.371174	0.890252	1.137475	1.264692	1.479262	1.641259	1.764101	1.854275

[Table 2. Percentage comparison of the growth of industries]

From the above table we could understand that the picture for the most beneficial industry is getting clearer but the table still looks complicated. So, we will be converting the table into a line chart for a better visual representation.



[Chart 2. Line chart showing the percentage comparison of the industries in space business]

The line chart we created from the percentage comparison shows that Consumer Broadband is on the rise, whereas Consumer TV is on the decline. These days, Millennials are avoiding cable in favour of streaming services-and some never got one at all, joining the "cord never" cohort. A report states that television ads have historically been a large contributor to driving conversation. Engagement Labs CEO Ed Keller explained how brands engaged consumers with full motion and sound in the golden age of television. In this new era, advertisers must engage customers and earn a return from their marketing investment by being more creative, more relevant, and more interesting. Conversations about paid advertisements tend to move away from traditional channels such as TV and toward digital ones. Digital ads now account for 31.8% of all paid-ad-inspired conversations, compared to 16.6% five years ago. At the same time, TV ads have fallen to second place from first at 37.4 percent in 2013.

Therefore, India should not be growing or investing in Consumer TV. Meanwhile, Consumer TV decline has a direct correlation with Consumer broadband growth.

It is critically important to the development of knowledge, the economy, and business activity that broadband is available to everyone. Every citizen can benefit from broadband by enhancing convenience, improving accessibility to quality services (e.g., health care, education, banking), and creating job opportunities. India's broadband growth has been fueled largely by smartphone adoption and low data prices in the last three years. This growth trend is expected to continue and accelerate with the penetration of broadband in rural areas and mass adoption of fixed broadband. Globally, COVID-19 has fueled the demand for high-speed, reliable broadband for work, learning, entertainment, and when buying products. We live in a virtual world, causing data consumption to explosion and

mobile and fixed broadband demand to multi-fold. It is expected that much of this digital behavior will continue. COVID-19 accelerated a major inflection point and set us on a path to accelerate the growth of broadband at an unprecedented pace.

At a compound annual growth rate (CAGR) of 9.3%, the global market for broadband internet services is expected to grow from \$248.66 billion in 2020 to \$271.71 billion in 2021. Several explanations can be given for this growth, including rearranging operations and recovering from COVID-19 impacts, which had earlier led to social distancing, remote working, and the closure of commercial activities, all of which posed challenges for operating efficiency. By 2025, the market is expected to reach \$355.42 billion at a CAGR of 7%.

Market growth for broadband internet services is driven by consumer demand for broadband. With the growing use of the internet for communication, information sharing, education, and entertainment, consumer broadband is on the rise. In addition, the government is playing an important role in stimulating demand for broadband internet services, providing better public online services in every sector, encouraging the use of broadband internet in rural and remote areas, and establishing privacy and quality standards, among other things.

In March 2020, the number of broadband users in India reached 687 million (i.e., more than 51 percent penetration of broadband). It is encouraging to see that India's broadband subscriptions have been growing at a rate of 35 percent per year. India has become the world's cheapest country for a 1GB wireless data plan, costing US\$0.15 (as of March 2020), thanks to increasing smartphone penetration and low data prices. Additionally, India is one of the largest consumers of the internet in the world as a result of this development.

V. RESULTS

Among the near-term objectives are the expansion of satellite fleets, landing a rover on Moon, sending humans into space, deploying more unmanned missions to moon, Mars, Venus and the Sun, and deploying more space telescopes in orbit for studying cosmic phenomenon. There are long-term plans for reusable launchers, heavy and super heavy launch vehicles, deployment of a space station, manned missions to Mars, Jupiter, Uranus, and Neptune, as well as exploration programs to planetary bodies.

Besides supporting both civilian and military domains, ISRO's programs have significantly contributed to India's socioeconomic development. They include disaster management, telemedicine, navigation and reconnaissance missions. India has also benefited immensely from ISRO's spin off technologies in engineering and medicine.

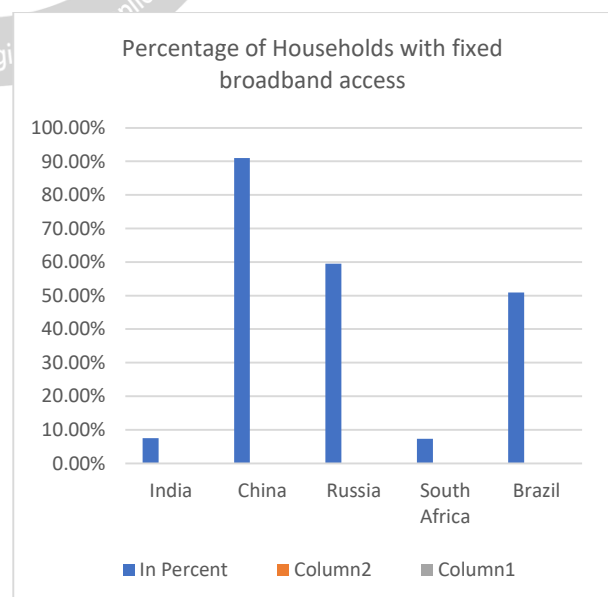
Providing a flagship programme to help the industry develop spacecraft on a routine basis will create large-scale

opportunities for private corporations in the Indian space industry. Private companies in India are producing small satellite launch vehicles to help build a strong space ecosystem and, in turn, gain a fair share of the growing launch market.

ISRO owns critical resources such as Earth observation satellite data archives that can be useful to individuals, businesses, and government as well as supporting better decisions and policies. Satellites are becoming a more important tool for environmental protection, disaster management, and defence.

Satellite manufacturing and rocket launching, the bread and butter of the space industry, will be driven by the 'incidental sectors' of telecommunications, transportation, banking, defence, and meteorology (T2BDM).

Due to the limited role that private Indian companies played so far, they have not been able to compete. It is unlikely they will be capable of handling independent space programmes like SpaceX has in the US. India's rapidly growing space-related industries can't rely on ISRO alone to meet its needs. ISRO and start-ups should explore joint space initiatives in equal measure. VCs will be more likely to invest in India's space sector if a business-friendly and encouraging space law is passed. In a variety of areas such as component manufacturing and satellite AIT, ISRO has encouraged PPP in the Indian space sector. As a result, private players are well positioned to mature technologically and adapt to space system requirements. Researchers and practitioners must figure out how to manage the growth of capital, firms, and knowledge, organize the supply chain, and implement sustainable space operations. There are many obstacles to overcome since there is little information available in space because of distance, gravity, the inhospitable environment and scarcity of resources.



[Chart 3. Column chart showing us the percentage of households with fixed broadband access]

From the chart we can conclude that a country's economic and social development is largely dependent on broadband connectivity. Market growth for broadband internet services is driven by consumer demand for broadband.

Consumer broadband is growing as more and more people use the Internet as a means of communication, information sharing, and entertainment. In addition, the government is playing an important role in stimulating demand for broadband internet services, providing better public online services in every sector, encouraging the use of broadband internet in rural and remote areas, and establishing privacy and quality standards, among other things. For India to compete with big players globally, it would be beneficial to develop this industry. To ensure broadband growth in the most efficient manner, several aspects need to be addressed, such as right of way issues, infrastructure deployment costs, levels of digital literacy, and access to affordable devices. Addressing these challenges requires contributions from the government, telecom providers, the regulator, and other stakeholders.

Developing the versatility of their platforms while manufacturing at scale is one of the challenges facing new space companies. Managing and securing the sustainability of mega-constellations will be the challenge in the longer term. Space companies that succeed in satellite launches will close the gap between the physical and virtual worlds to win the space race. To become a global leader in the space sector, India has the necessary infrastructure, provisioning, and young talent to master the newest space technologies. By leveraging new V+R technologies, we can reduce the gap between these two worlds, increasing new possibilities and addressing problem-solving capabilities to the emerging companies. Because there is no national space legislation, conducting space-related business in the country is unclear. The global space industry is not aware of its demands. In the Indian space sector, there is no established regulatory framework or funding guidelines for technology commercialisation.

VI. CONCLUSION

Throughout history, human beings have been fascinated by space, the universe, the solar system, and planets. Through each exploration, the desire to know more about space increases, transforming it into a field for research and development on a geopolitical scale and creating a space exploration footprint for the country. In India there are many inspirational scientists and astronauts who have contributed to space research and development and their lives are inspiring students and engineers to explore the domain of space and aeronautics. Indian films have illustrated how the Mars mission was a triumph. Five decades ago, ISRO commenced its ambitious and daring journey with a record of more than 100 successful space missions, breaking the stranglehold of a few countries who had space programs. As of today, ISRO ranks among the six world's largest

government space agencies. ISRO's journey has been refreshingly audacious, starting with the launch of 30 kg payload rockets and carrying 4,000 kg payloads into space. A fisherman setting out to sea hoping to catch a good catch; a soldier in remote Siachen desperate for medical attention; a farmer whose harvest depends on monsoon forecasts; and rural students with lessons transmitted into their rooms. These are witnessed by Indians from various walks of life.

The stories of all these disparate characters are connected by the cosmic thread of an Indian scientific group whose goal is to reach for the stars and has a profound impact on the lives of hundreds of millions of Indians.

The ISRO's space research centres, including Vikram Sarabhai Space Centre and Space Applications Centre, have harnessed this momentous growth by relying on other countries for space programs to now have its own robust launch vehicle program. The Indian Space Research Organization and its affiliated research centres are training personnel from numerous countries all over the world in order to further enhance the field of space research. With this increased openness over the past decade, there have been more launches of rockets into orbit as well as more launches of spacecraft, including satellites and probes.

ISRO should also be interested in collaborating with some space organizations like Artemis Project to take advantage of new opportunities. Indian Space Business will be able to understand and adapt the many new innovative tools and methods used by several space organisations and gain a competitive advantage based on the new knowledge gained.

At the moment, ISRO is wasting a lot of its resources on routine activities, which is causing it to delay its strategic objectives. Numerous private companies have been involved in space activities, including launching communication satellites and weather satellites. By outsourcing these activities to private companies, organisations like NASA and ISRO can devote their time and resources to scientific exploration projects.

In today's society, these large companies have developed their small space, aerospace, and defense divisions so they can easily invest in research and innovate. This can only be accomplished if they are confident in the continuity of their business and their contracts, have unimpeded regulation, and are able to penetrate overseas markets. Companies with expertise in Construction, Mining, Energy, Transportation, Hospitality, and Real Estate will outperform the rest. Investing and legislating properly, as well as giving start-ups the opportunity to collaborate with private investors, can make India highly influential in the global space industry. However, India's current state at this time would require several years for it to compete at a global level. In India, social welfare has always been a priority, and now India's attention is turning to the competitive space industry. Despite an inevitable explosion in growth, India must first work with

private investors to collaborate with start-ups in order to grow its Space Business properly with funding and innovative technology, as well as invest and develop its consumer broadband industry to get an edge over other big players in the space business market.

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REFERENCE

- [1] Chaitanya Giri (2021). A space sector bull run is no longer just a pie in the sky. Mint, <https://www.livemint.com/opinion/online-views/a-space-sector-bull-run-is-no-longer-just-a-pie-in-the-sky-11612454419563.html>
- [2] FE Online (2020) India opens space sector to private players: What it means for ISRO. Financial Express, <https://www.financialexpress.com/lifestyle/science/india-opens-space-sector-to-private-players-what-it-means-for-isro/2005105/>
- [3] Arun Rao (2020) India has the potential to be the next space hub of the world The Economic Times, <https://economictimes.indiatimes.com/small-biz/sme-sector/india-has-the-potential-to-be-the-next-space-hub-of-the-world/articleshow/78840533.cms?from=mdr>
- [4] M Somasekhar (2020) ISRO: Harnessing space tech for public good The Hindu Business Line, <https://www.thehindubusinessline.com/blchangemakers/harnessing-space-tech-for-public-good/article31020925.ece>
- [5] Rakesh Sood (2019) Expanding India's share in global space economy The Hindu, <https://www.thehindu.com/opinion/lead/expanding-indias-share-in-global-space-economy/article28286469.ece>
- [6] HT Correspondent (2020) Mission Shakti makes India space superpower, live satellite shot down: PM Modi Hindustan Times, <https://www.hindustantimes.com/india-news/india-takes-a-giant-leap-in-space-shoots-down-satellite-says-pm-modi/story-VuT1LqZsGYBmf7qHTctB9K.html>
- [7] Joe Landon and Etienne Schneider (2017) These 5 industries will be first to do business in space World Economic Forum, <https://www.weforum.org/agenda/2017/11/industries-will-make-money-in-space/>
- [8] K. Kasturirangan and Editor Raghendra Jha (2006) Chapter 10. India's Space Enterprise — A Case Study in Strategic Thinking and Planning 7. Economic Aspects of India's Space Program (200-206) The First Ten K R Narayanan Orations. Essays by Eminent Persons on the Rapidly Transforming Indian Economy Australian National University E PRESS https://www.google.co.in/books/edition/The_First_Ten_K_R_Narayanan_Orations/c3y67Q23584C?hl=en&gbpv=1
- [9] Preparing to scale new heights: Enhancing private participation in India's commercial space sector (2020) PWC, <https://www.pwc.in/research-insights/2020/preparing-to-scale-new-heights.html>
- [10] Delloite, Antrix Corporation Limited, CII Overview of Indian Space Sector 2010 6. Role of Department of Space in India (16-20) https://www.sac.gov.in/SAC_Industry_Portal/publication/media/article/Indian_Space_Sector_2010.pdf
- [11] Space: Investing in the final frontier (2020) Morgan Stanley <https://www.morganstanley.com/ideas/investing-in-space>
- [12] Delloite and CII Broadband for inclusive development—social, economic, and business (2020) (02-06) <https://www2.deloitte.com/content/dam/Deloitte/in/Documents/technology-media-telecommunications/in-racii-broadband-report-telecom-convergence-summit.pdf>
- [13] Richard Carufel (2019) How TV's decline is reducing consumer engagement with brands Agility PR Solutions <https://www.agilitypr.com/pr-news/public-relations/how-tvs-decline-is-reducing-consumer-engagement-with-brands/>
- [14] Broadband Internet Services Global Market Report 2021: COVID 19 Impact And Recovery To 2030 The Business Research Company <https://www.thebusinessresearchcompany.com/report/broadband-internet-services-global-market-report-2020-30-covid-19-implications-and-growth>