

Growth Model of ISRO in Indian Perspective

Kamaljeet Singh, AV Nirmal

Systems Engineering Group, ISRO Satellite Centre, Bangalore

Abstract

The story of ISRO ranging from quick transformation from launching sounding rockets to mission like Mars is the culmination of the strong foundation and methodological learning from past failures. ISRO is working in the varied and complex technical fields such as earth observation, communication, navigation, disaster management, climate and environment monitoring. In spite of more than 15 units and multiple ground stations across world the integrated approach of satellite is made possible by ISRO by keeping high spirit and sticking to professional way of working. System of ISRO is laid on such a strong foundation that even small hiccups could not shake it and it overcomes at must faster pace. Further the spread of the units across India and people employed from across the country having different faiths amply proof that with right atmosphere and environment the organization can touch greater heights. The model which evolved over the year is worth emulating as students from humble background and normal universities also excelled in the same environment. The model of growth is discussed so as others can benefit from the same and can provide tangible contributions in the country's progress.

Keywords: ISRO, satellite, culture, management.

I. INTRODUCTION

The evolution of ISRO being shaped by visions of Dr Vikram Sarabhai with the motto of serving society with his famous quote, "we must be second to none in the applications of advanced technologies to the real problems of man and society". Dr Sarabhai envisioned that the resources in space have the potential to address the real problems of man and society. The focus of ISRO is to have usage of outer space and harnessing space technology for peaceful use. It was on this background that foundation of ISRO is laid and reinstates the believe that any work started with noble deeds is bound to taste success. The leaders of ISRO always believe in the potential of their employee and make the things happen with the available resources. They not only provided the direction to the organization but equally provided excitement to the employees by striving them to do better.

The architect of the ISRO is build by the leaders who are great visionary and within a span of 40 years a mere idea led to present day veritable giant. The enormous work of creating infrastructure, training and recruiting manpower, creating environment, planning, execution and tie-up with advanced countries is made possible in short duration. This approach also calls for calculated risks and support of government machinery with strong commitment to the cause and dedication to achieve the same. The other factors are to get continual funding and setting the achievable goals with intention and plan to achieve it. The other R&D institutes which are established prior to ISRO are either closed or way behind their peers while proving white elephant to the economy. In such scenario it is essential to explore the ingredients with which ISRO philosophy and its standing

among peers are recognized world over. The fact is that in spite of following all the procedures and without deviating the same, the output is exceeded far from expectations. The main objectives of ISRO are [1]

- Design and development of launch vehicles and related technologies for providing access to space.
- Design and development of satellites and related technologies for earth observation, communication, navigation, meteorology and space science.
- Indian National Satellite (INSAT) programme for meeting telecommunication, television broadcasting and developmental applications.
- Indian Remote Sensing Satellite (IRS) programme for management of natural resources and monitoring of environment using space based imagery.
- Space based Applications for Societal development.
- Research and Development in space science and planetary exploration.

The story of ISRO is also having its own share of failures which paved the way of learning and overcoming the same in time bound manner. The initial concept of laying foundation of an organization is a hurricane job and even more difficult if the technology is sufficiently advanced and not a single expertise available to take it forward. The integral part of ISRO success is attributed to the greater emphasis to lessons learnt in due course of time. These lessons are integral part of the each brain storming meeting. The initial failures in satellite building where issues related with thermal, power apart from launch vehicles are threadbare discussed, deliberated and further implemented in the next project. The strong foundation on reliability aspects further strengthen the zero defect mechanism adopted in this direction. ISRO model is worth emulating and inspire many industries across the globe due to its unique ISRO culture. This article will analyze the overall model of ISRO, success scenario and analyze the factors responsible for the same along with the methodologies to replicate in other sectors.

II. ISRO CULTURE

The Department of space and ISRO is directly under the watchful eyes of PM and policies are charted out by the Space commission. The main lead centres are VSSC,LPSC,SHAR,ISAC,SAC,NRSC and fully supported by small centres such as IPRC,LEOS,IISU,DECU,IIRS,MCF and ISTRAC. Various other centres working on applications, educational activities, indigenization aspects such as PRL,NARL,NE-SAC,SCL,IIST. The various hierarchical position in ISRO starts with: Section Head, Division Head, Group Head, Group Director, Project Director, Deputy Director, Associate Director, and Director. The first and foremost requirement of any organization is the choice of the manpower and the recruitment policy which is based in ISRO on the various traits such as

- Scientific knowledge
- Research aptitude
- Logical thinking
- Updated knowledge
- Creativity

The unique part in ISRO is having a healthy and working culture where all are treated at par. The opinions of each one is deliberated and mindset of superiority is not followed paving way for the juniors to feel part of the system. The main aim is to have consistency of purpose and all people strives to achieve the same. The main strengths of the ISRO culture are:

- Highly motivated manpower
- High Integrity
- Loyalty
- Foresightedness
- Team spirit
- Decisiveness
- Initiation

Further providing world class infrastructure, achieving perfection in each domain, respecting and recognition each individual are some of the attributes which are unique part of ISRO culture.

III. ISRO MODEL

India is at present recognised as a role model in applications of space technology for socio-economic development. As per Indian tradition ISRO successfully moulded its *Chintana Shakti* into *Kriya Shakti*. As the workforce is always in high spirit and motivated so any new challenge is taken happily. The saying of Buddha 'You are what you think' is totally applicable in this scenario. The success of organizations such as ISRO, BARC rely heavily on this model where academic interactions are deep rooted in the system. But the model is not duplicated by other industries resulting in the quality and rendering them way behind the peers in the market. Innovations and new development are miniscule compared to such models followed by the developed nations due to lack of synergy between them [2].

The another amazing aspects is that in spite of following all the rules and regulation the output is amazingly high compared to many other industries. The following reasons are the core of its success:

- Dissemination of knowledge and sharing attitude
- Openness resulting in free flow of ideas and accepting criticism in right spirit
- Team work and disciplined workforce
- Technical liberty
- Importance on quality and reliability aspects
- Optimum usage of available resources
- Strong and mature leadership

The pillars of ISRO stand on the above where technical discussions and points are taken seriously. Transfer of knowledge to the young engineers and grooming them results in the innovation and growth. This results in making and launching of multiple satellites having multidisciplinary in nature within a limited timeframe.

The work of ISRO ranges from building satellites for communication and remote sensing, space transportation system and various applications. The main aspect of ISRO is to take up the projects in mission mode and to

deliver on time. Motto of harnessing space technology for national development while pursuing space science research and planetary exploration is still guiding mantra for envisioned programmes. Focussing on progress achieved, generating time bound actions and identifying the task is the habitual process. Programme management and systems group, project director, programme management board, programme executive board and programme management council is the chain taken for the new project supported by PDRs and CDRs.

The promotion of the scientific manpower is carried out on various parameters with the board consisting of domain experts and academicians. The main parameters are

- Subject related skill
- New skills acquired
- Targets achieved
- Quality of work
- Application development
- Vision
- Understanding and personal traits

Technology Development is vital for the organization to keep abreast with the global Space Market. Technology Development Programmes and RESPOND Programme are the unique programmes run by ISRO to keep updation of the latest in the field and having close coordination with the academia of the country. Office of Innovations Management (OIM) is another flagship programme which is having main objectives as below:

- Catalogue all the innovations carried out at different ISRO Centres.
- Tangible parameters for identifying innovations.
- Approach towards fostering further spurt in Innovations in ISRO both cultural and institutional.
- Approach/Encouragements for making larger cross-section engineers/scientists to participate in this renewed endeavours of Innovations.
- Tangible goals of achieving further Innovations, spin-offs and related Technology Transfers

ISRO is facilitating investment, fostering innovation, enhancing skill development, protecting IPR and building best manufacturing infrastructure. *Yes we can and Yes we will* the present motto reflects the farsightedness of the present day leaders of ISRO besides having personal rapport with the employees. Loading with more projects results in healthy competition among various groups resulting in the speeding up of activities resulted in motivated manpower by directly associating them with the missions. This is made possible by envisioning various projects and presently around 80 Projects are envisaged during 2017-22 time frame. High throughput communication satellite, Cartosat series, Rendezvous and Docking, Resources finding series, Oceans monitoring, Advanced geo-imaging satellite, Second generation navigation satellites provides technology development challenges in mission mode.

IV. SOCIAL MEDIA: OUTREACH

Media campaigns on important events, campaign through social media, organization of exhibition, educational activities like lectures, interactive sessions with students, quiz programmes, publications, video, documentaries are the programmes run by ISRO to spread awareness about its programmes and catching up the young minds.

A single success paves the way for trying to achieve more and this multiple effects results in concentrated effort by all. This leads to organization recognition which further instils confidence and enthusiasm. Also due to involvement in projects the person is not involved in unproductive activities and takes it as national pride by contributing in this endeavour. Mars mission created lot of interest among young generation which is evident by the response on the ISRO facebook account. This creates awareness among the masses and also new ideas and suggestions for charting out the programmes for the future.

Missions	Quantity
Spacecraft	83
Launch	58
Student Satellites	8
Re-enty	2
Foreign Satellites	79

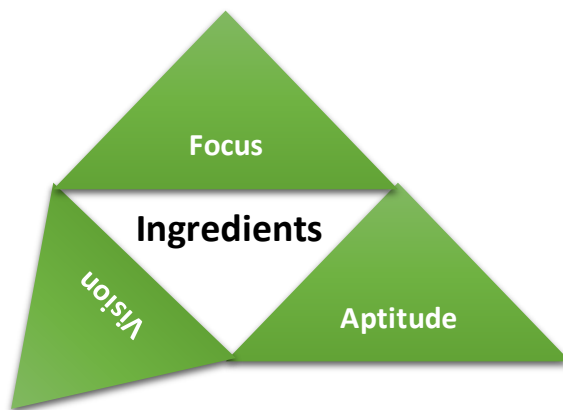


Fig1: Missions overview (2016) and approach adopted

V. FUTURE ASPECTS

The increased number of spacecrafts per year, identifying and expanding the industry participation in the areas of developing satellite subsystems, ground systems and integration and testing of the satellite/sub-systems will give necessary impetus. In spite of ISRO wings spread across the country still the potential of it is to move one notch higher by having all the centres contributing the pace and momentum of the lead centres. The major part of the components and devices are still imported which needs immediate attention. ASIC, sensors and other

devices needs to be indigeniouted so as to bring self reliance and saving foreign exchange. Fabs to take up such activity should be encouraged in the private sectors and public-private partnership to be encouraged. Further solar cells, thermal control materials, specialized alloy, optical materials, test and measurement equipment are other materials which needs indigenization. This can also results in multiple spin offs which can be tapped for societal benefits and due to varied domain it needs technical expertise to be created.

At present the major workforce has reaped the benefit of the forefathers and the next step is to realize the systems with the adoption of the latest technology. This needs another revolution to take it at another level which can only possible by adopting ISRO culture.

VI. SUMMARIZATION

ISRO main strength lies in converting failures in rich learning experiences and eventually continual strive for trumps[3]. The core strength lies in developing holistic leadership skills to young people resulted in a considerable job satisfaction and feeling part of the family from day one. The main attributes can be summarized as

- Democratic culture: work ethics developed due to this trait
- Transparency: design reviews, various assessments, open discussions
- Careful planning: result oriented approach
- Building leadership: bringing out extraordinary from ordinary and involving juniors
- Smooth transition

The capability of ISRO in the satellite building area rivalled that of the most advances countries of the world. The present mantra given by the Chairman ISRO is “ Look at what we need to complete, Look at what we need to work on in the near future and Look a little farther into future” amply proof that goals are well defined. This article dwelt upon the reasons, formation and mechanisms, working culture, model and various methodologies adopted in due course by ISRO to achieve the present stature in the country.

REFERENCES

1. www.ISRO.gov.in
2. Kamaljeet Singh & A V Nirmal,” Technological advancement by bridging the gap between industry and academia ,” IEEE-MITE 2017,accepted for oral presentation
3. Aravanmudan, *ISRO:A personal history*, Harper Collins, 2017