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Leaders

Technology, unlike science, is a group activity. It is not based on individual intelligence, but on the interaction of many people. I think the biggest success of IGMDP is not the fact that in record time the country acquired the capability of making five state-of-the-art missile systems but that through it, some superb teams of scientists and engineers have been created. If someone asks me about my personal achievements in Indian rocketry, I would put it down to having created a challenging environment for teams of young people to work in.

In their formative stages, teams are much like children in spirit. They are as excitable, as full of vitality, enthusiasm, curiosity and the desire to please and excel. As with children, however, these positive attributes can be destroyed by the behaviour of misguided parents. For teams to be successful, the environment must offer scope for innovation. I confronted many such challenges during the course of my work at DTD&P (Air), ISRO, DRDO and elsewhere, but always ensured for my teams an environment which allowed innovation and risk-taking.

When we first began creating project teams during the SLV-3 project and later in IGMDP, people working in these teams found themselves in the frontline of their organizations' ambitions. Since a great deal of psychological investment had been made in these teams, they became both highly visible and highly vulnerable. They were personally expected to make a disproportionate contribution to win collective glory.

I was aware that any failure in the organizational support system would negate the investment in team strategies. The teams would be relegated to the league of average working groups and might fail even there, unable to meet the high expectations set for them. On several occasions, the organization was on the verge of losing its nerve and imposing restraints. The high level of uncertainty and complexity associated with team activity very often proves to be a trap for the unwary.

In the early years of the SLV-3 project, I often had to counter nervousness of the top people because progress was not tangibly or immediately visible. Many felt that the organization had lost control over SLV-3, that the team would run on unchecked, and cause chaos and confusion. But on all occasions, these fears were proved imaginary. There were many people in powerful positions in organizations, for example at VSSC, who underestimated our responsibility and commitment to organizational objectives. Dealing with such people was a crucial part of the whole operation, and this was performed dexterously by Dr Brahm Prakash.

When you work as a project team, you need to develop a complex view of the success criteria. There are always multiple and often conflicting sets of expectations that exist about a team's performance. Then, quite often, the project teams are virtually torn apart in their attempt to accommodate the needs and constraints of sub-contractors outside the organization and specialist departments within the organization. Good project teams are able to quickly identify the key person or people with whom negotiations must take place. A crucial aspect of the team leader's role is to negotiate with these key people for their requirements, and to ensure that the dialogue continues on a regular basis as the situation develops or changes. If there is one thing outsiders dislike, it is unpleasant surprises. Good teams ensure that there are none.

The SLV-3 team developed their own internal success criteria. We articulated our standards, expectations and objectives. We summarised what was needed to happen for us to be successful and how we would measure success. For instance, how we were going to accomplish our tasks, who would do what and according to what standards, what were the time limits and how would the team conduct itself with reference to others in the organization.

The process of arriving at the success criteria within a team is an intricate and skilled one because there are a lot of things going on below the surface. On the surface, the team is simply working to achieve the project's goals. But I have repeatedly seen how people are poor at articulating what they want—until they see a work centre doing something they don't want them to do. A project team member must in fact act like a detective. He should probe for clues as to how the project is proceeding, and then piece together different bits of evidence to build up a clear, comprehensive and deep understanding of the project's requirements.

At another level, the relationship between the project teams and the work centres should be encouraged and developed by the project leader. Both parties must be very clear in their minds about their mutual interdependence and the fact that both of them have a stake in the project. At yet another level, each side should assess the other's capabilities and identify areas of strength and weakness in order to plan what needs doing and how it should be done. In fact, the whole game can be seen as a process of contracting. It is about exploring and arriving at an agreement on what each party expects of the other; about realistically understanding the constraints of the other party; and about communicating the success criteria while defining some simple rules about how the relationship is to work; but above all, it's the best means of developing clarity in the relationship, both at the technical and personal levels, in order to avoid any nasty surprises in the future. In IGMDP, Sivathanu Pillai and his team did some remarkable work in this area through their home-grown technique, PACE, which stands for Programme Analysis, Control and Evaluation. Each day between 12 noon and 1 p.m., they would sit with a project team and a particular work centre that was on the critical path and assess the level of success among themselves. The excitement of planning ways to succeed and the vision of future success provide an irresistible form of motivation which, I have found, always makes things happen.

The concept of Technology Management has its roots in the Developmental Management models which originated in the early Sixties out of a conflict between harmony-seeking and output-oriented management structures. There are basically two types of management orientations: primal, which values an economic employee, and rational,

which values an organizational employee. My concept of management is woven around an employee who is a technology person. While the primal management school recognizes people for their independence, and rational management acknowledges them for their dependability, I value them for their interdependence. Whereas the primal manager champions independent enterprise and the rational manager serves cooperation, I moot interdependent joint ventures, getting the forces together, networking people, resources, time schedules, costs, and so on.

Abraham Maslow was the first person to suggest the new psychology of self-actualization at a conceptual level. In Europe, Rudolf Steiner and Reg Revans developed this concept into the system of individual learning and organizational renewal. The Anglo-German management philosopher, Fritz Schumacher introduced Buddhist economics and authored the concept of "Small is Beautiful". In the Indian subcontinent, Mahatma Gandhi emphasized grass root level technology and put the customer at the centre of the entire business activity. JRD Tata brought in progress-driven infrastructure. Dr Homi Jehangir Bhabha and Prof. Vikram Sarabhai launched the high, technology-based atomic energy and space programmes with a clear-cut emphasis on the natural laws of totality and flow. Advancing the developmental philosophy of Dr Bhabha and Prof. Sarabhai, Dr MS Swaminathan ushered the Green Revolution into India working on another natural principle of integrity. Dr Verghese Kurien brought in a powerful cooperative movement through a revolution in the dairy industry. Prof. Satish Dhawan developed mission management concepts in space research. These are but a few examples of individuals who have not only articulated but also implemented their ideas, thus changing forever the face of research and business organizations all over the world.

In the IGMDP, I attempted to integrate the vision of Prof. Sarabhai and the mission of Prof. Dhawan by adapting the high technology setting of Dr Brahm Prakash's space research. I attempted to add the natural law of Latency in founding the Indian Guided Missile Programme in order to create a completely indigenous variety of technology management. Let me use a metaphor to illuminate this.

The tree of technology management takes root only if there is the self-actualization of needs, renewal, interdependence, and natural flow. The growth patterns are characteristic of the evolution process, which means that things move in a combination of slow change and sudden transformation; each transformation causes either a leap into a new, more complex level or a devastating crash to some earlier level; dominant models reach a certain peak of success when they turn troublesome; and the rate of change always accelerates.

The stem of the tree is the molecular structure in which all actions are formative, all policies are normative, and all decisions are integrative. The branches of this tree are resources, assets, operations, and products which are nourished by the stem through a continuous performance evaluation and corrective update.

This tree of technology management, if carefully tended, bears the fruits of an adaptive infrastructure: technological empowerment of the institutions, the generation of technical skills among people, and finally self-reliance of the nation and improvement in the quality of life of its citizenry.

When IGMDP was sanctioned in 1983, we did not have an adequate technology base. A few pockets of expertise were available, but we lacked the authority to utilize that expert technology. The multi-project environment of the programme provided a challenge, for five advanced missile systems had to be simultaneously developed. This demanded judicious sharing of resources, establishing priorities, and ongoing induction of manpower. Eventually, the IGMDP had 78 partners, including 36 technology centres and 41 production centres spread over public sector undertakings, ordnance factories, private industries, and professional societies, hand-in hand with a well-knit bureaucratic structure in the Government. In the management of the Programme, as much as in the technological inputs, we attempted to develop a model that was appropriate, even tailor-made, for our very specific needs and capabilities. We borrowed ideas that had been developed elsewhere, but adapted them in the light of what we knew were our strengths and what we recognized as the constraints we would be compelled to work under. All in all, the combination of appropriate management and our cooperative endeavours helped to unearth the talent and potential that lay unused in

our research laboratories, government institutions and private industries.

The Technology Management philosophy of IGMDP is not exclusive to missile development. It represents the national urge to succeed and an awareness that the world will never again be directed by muscle or money power. In fact, both these powers will depend on technological excellence. Technology respects only technology. And, as I said in the beginning, technology, unlike science, is a group activity. It does not grow only through individual intelligence, but by intelligences interacting and ceaselessly influencing one another. And that is what I tried to make IGMDP: a 78-strong Indian family which also makes missile systems.

There has been much speculation and philosophizing about the life and times of our scientists, but not enough exploration in determining where they wanted to go and how they reached there. In sharing with you the story of my struggle to become a person, I have perhaps given you some insight into this journey. I hope it will help at least a few young people to stand up to the authoritarianism in our society. A characteristic feature of this social authoritarianism is its insidious ability to addict people to the endless pursuit of external rewards, wealth, prestige, position, promotion, approval of one's lifestyle by others, ceremonial honours, and status symbols of all kinds.

To successfully pursue these goals, they have to learn elaborate rules of etiquette and familiarize themselves with customs, traditions, protocols and so on. The youth of today must unlearn this self-defeating way of life. The culture of working only for material possessions and rewards must be discarded. When I see wealthy, powerful and learned people struggling to be at peace with themselves, I remember people like Ahmed Jallaluddin and Iyadurai Solomon. How happy they were with virtually no possessions!

On the coast of Coromandel
Where the earthy shells blow,
In the middle of the sands
Lived some really rich souls.
One cotton lungi and half a candle –
One old jug without a handle
These were all the worldly possessions
Of these kings in the middle of the sands.

How did they feel so secure without anything to fall back upon? I believe they drew sustenance from within. They relied more on the inner signals and less on the external cues that I have mentioned above. Are you aware of your inner signals? Do you trust them? Have you taken control over your life into your own hands? Take this from me, the more decisions you can make avoiding external pressures, which will constantly try to manipulate you, the better your life will be, the better your society will become. Infact the entire nation will benefit by having strong, inward-looking people as their leaders. A citizenry that thinks for itself, a country of people who trust themselves as individuals, would be virtually immune to manipulation by any unscrupulous authority or vested interest.

Your willingness to use your own inner resources to invest in your life, especially your imagination, will bring you success. When you address a task from your own uniquely individual standpoint, you become a whole person.

Everyone on this planet is sent forth by Him to cultivate all the creative potential within us and live at peace with our own choices. We differ in the way we make our choices and evolve our destiny. Life is a difficult game. You can win only by retaining your birthright to be a person. And to retain this right, you will have to be willing to take the social or external risks involved in ignoring pressures to do things the way others say they should be done. What will you call Sivasubramania Iyer inviting me to have lunch in his kitchen? Zohara, my sister, mortgaging her gold bangles and chains to get me into engineering college? Prof. Sponder insisting that I should sit with him in the front row for the group photograph? Making a hovercraft in a motor-garage setup? Sudhakar's courage? Dr Brahm Prakash's support? Narayanan's management? Venkataraman's vision? Arunachalam's drive? Each is an example of a strong inner strength and initiative. As Pythagoras had said twenty-five centuries ago, "Above all things, reverence yourself."

I am not a philosopher. I am only a man of technology. I spent all my life learning rocketry. But as I have worked with a very large cross-section of people in different organizations, I had an opportunity to understand the phenomenon of professional life in its bewildering

complexity. When I look back upon what I have narrated so far, my own observations and conclusions appear as dogmatic utterances. My colleagues, associates, leaders; the complex science of rocketry; the important issues of technology management; all seem to have been dealt with in a perfunctory manner. The despair and happiness, the achievements and the failures—differing markedly in context, time, and space—all appear grouped together.

When you look down from an aircraft, people, houses, rocks, fields, trees, all appear as one homogeneous landscape, it is very difficult to distinguish one from another. What you have just read is a similar bird's-eye view of my life seen, as it were, from afar.

My worthiness is all my doubt –
His merit – all my fear –
Contrasting which my quality
Does however – appear.

This is the story of the period ending with the first Agni launch—life will go on. This great country will make enormous strides in all fields if we think like a united nation of 900 million people. My story—the story of the son of Jainulabdeen, who lived for over a hundred years on Mosque Street in Rameswaram island and died there; the story of a lad who sold newspapers to help his brother; the story of a pupil reared by Sivasubramania Iyer and Iyadurai Solomon; the story of a student taught by teachers like Pandalai; the story of an engineer spotted by MGK Menon and groomed by the legendary Prof. Sarabhai; the story of a scientist tested by failures and setbacks; the story of a leader supported by a large team of brilliant and dedicated professionals. This story will end with me, for I have no belongings in the worldly sense. I have acquired nothing, built nothing, possess nothing—no family, sons, daughters.

I am a well in this great land
Looking at its millions of boys and girls
To draw from me
The inexhaustible divinity
And spread His grace everywhere
As does the water drawn from a well.

I do not wish to set myself up as an example to others, but I believe that a few readers may draw inspiration and come to experience that ultimate satisfaction which can only be found in the life of the spirit. God's providence is your inheritance. The bloodline of my great-grandfather Avul, my grandfather Pakir, and my father Jainulabdeen may end with Abdul Kalam, but His grace will never cease, for it is Eternal.

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