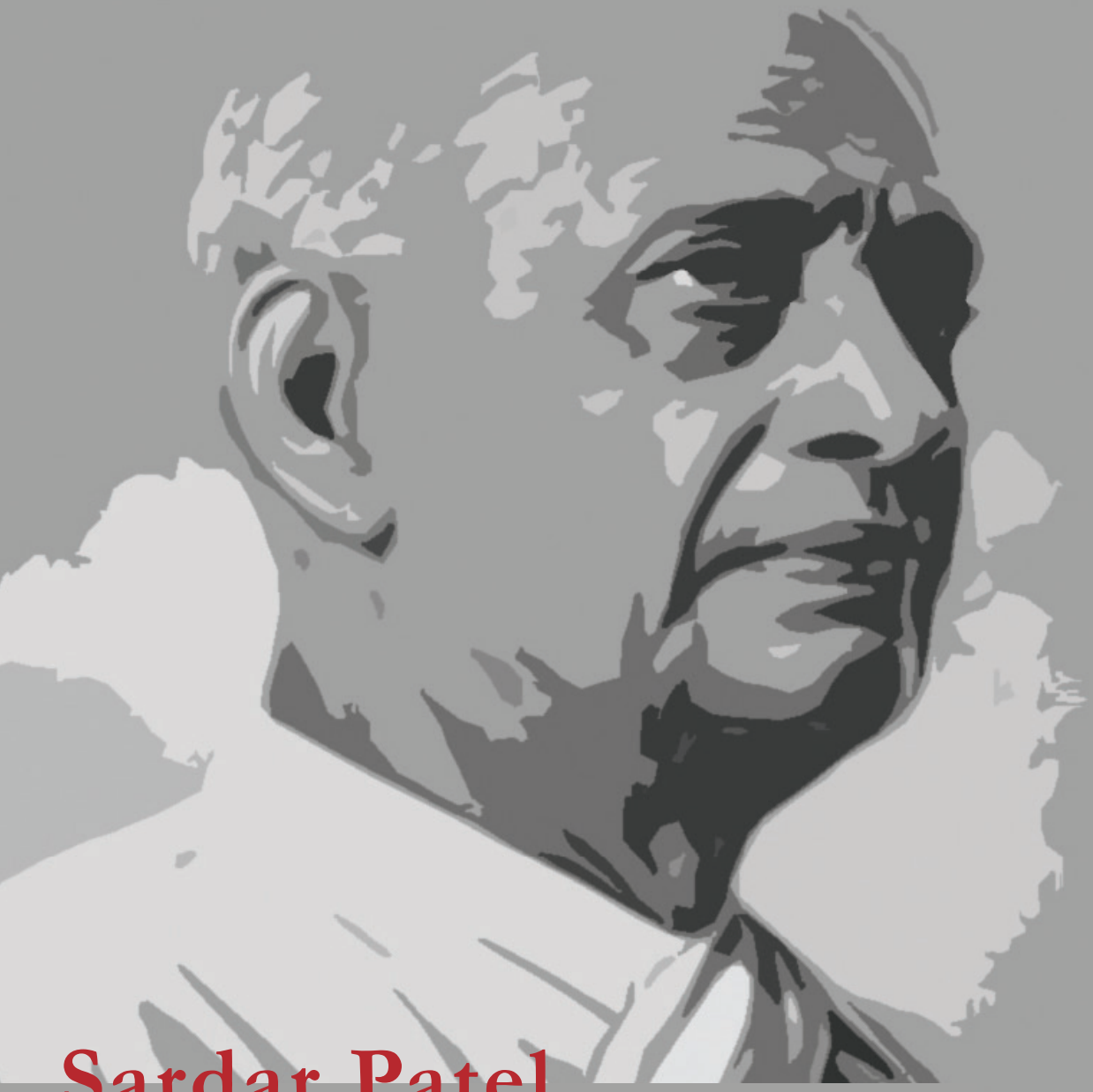
IC Centre for Governance



Sardar Patel Lecture on Governance

New Delhi | February 19, 2022

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IC Centre for Governance

The IC Centre for Governance has been set up with the objective of collective thinking and acting on important issues of governance. It believes that public governance is too serious a matter to be left entirely to the state and that the involvement of the Civil Society is not only desirable but also essential. The Centre seeks to strengthen the capacity of Civil Society and government for ensuring good governance.

Read more about the Centre at https://www.iccfg.net/

The 'Sardar Patel Lecture on Governance' is printed and published
by Mahesh Kapoor on behalf of the
IC Centre for Governance. New Delhi- 110057

Publication Coordinator and
Cover Design - Vinod Kumar

Printed at Rakmo Press Pvt. Ltd.
C-59, Okhla Industrial Area,
Phase I, New Delhi-110020

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Dr. K Kasturirangan

Former Chairman, ISRO, MP (Rajya Sabha)
Member Planning Commission

PROGRAMME

About the Lecture

"In a tough time the cowards find excuses, the brave people find the way".

Sardar Vallabh Bhai Patel

In every programme on Ethics in Governance conducted by IC Centre for Governance since 2005, the participating members of the All India Services are being reminded of the stirring words and inspiring actions of Sardar Patel, the tallest among nation builders of India. His address to the first batch of the Indian Administrative Services is circulated to them to act as a veritable guide in their career.

Sardar Patel was a true nationalist, who placed the interests of the country above everything else. Nothing else except the country mattered to him. It would be apt to describe him as the unifier of India and what was achieved by him during the turbulent days of partition remains unparalleled in modern history.

In our view, it is necessary to reiterate the work and principles of the Sardar—loyalty to the motherland, unshakeable commitment to nationalism and unflinching service to the Nation – so that the new generations do not forget the great legacy.

The Centre has, therefore, decided to pay its humble tribute to the great leader by institutionalizing an annual lecture on the theme of Governance in his name. This small initiative is aimed at keeping his fire of nationalism alive in our hearts and reiterating his principles of governance to motivate those in government and those who observe the governments from outside.

The first IC CfG Sardar Patel Lecture on Governance was delivered by Shri M Venkaiah Naidu, the Vice President of India on 24 January 2020. The second lecture was delivered by Dr. K. Kasturirangan, Former Chairman, ISRO, MP (Rajya Sabha) on February 19, 2022.

Prabhat Kumar

President, IC Centre for Governance

INTRODUCTION

On behalf of the IC Centre for Governance. I have great pleasure in welcoming you all to this second Sardar Patel lecture on governance. The first lecture was delivered by the Honorable Vice President of India Shri Venkaiah Naidu in January 2020

I have the honour, privilege and pleasure this evening to welcome Dr Krishnaswamy Kasturirangan, the keynote speaker of this evening. Dr Kasturirangan is a very well-known scientist who has been the chairman of ISRO for nine years. He is a man of many parts. He is a former member of the Parliament, Chancellor of the Jawaharlal Nehru University, former member of the Planning Commission and is currently the Chairman of Central University of Rajasthan. He was awarded the Padma Vibhushan. Every word that is spoken by him will be worthy of great attention.

This lecture was planned offline at the India International Centre but due to the restrictions imposed on account of covid-19 we have had to postpone it and now we are having it this evening online.

While there is a disadvantage of not listening to the speaker in person, there is a silver lining in as much as that we have participants not only from Delhi but now from all over the country. In fact, I can even spot someone from outside the country. With these words I would now request Shri Prabhat Kumar to formally introduce the speaker of the evening and give his opening remarks.

Mahesh Kapoor

Vice President, IC Centre for Governance

Welcome Speech by Prabhat Kumar, President, IC Centre for Governance

I have the honour to welcome you on the occasion of the second Sardar Patel Lecture organized by the IC Centre. We would have liked to have this event offline at the India International Centre as per original plan. Three dates during the last one year were scheduled but owing to the ravages of the pandemic, a physical event could not materialize.

As most of you are aware, the IC Centre was conceived as a multi stakeholder alliance of professionals from different disciplines to deliberate on governance in general and public governance in particular with a view to contributing their knowledge and experience towards better governance. The Centre has been involved in several activities including advocacy and research, training and conferencing, and publishing a professional journal. It also has a fellowship programme for supporting research studies on governance.

When we looked around on the internet, we could not find any periodic lecture on the subject of governance. And we thought that it was a lacuna waiting to be filled.

Friends, in the third decade of the millennium, confusion prevails. Our problems are big and getting bigger. It is in this context that greater attention needs to be paid to the quality of governance. The increasing divide between a few and the rest should, in my view, be studied in depth with a view to ascertain whether there is a weak or strong correlation between the spread of development and the quality of governance.

We have always believed that governance is too serious a matter to be left entirely to the people in government. For too long, we have left the task of decision making on issues concerning the lives of millions in the hands of the political executive and the bureaucratic functionaries. I think the involvement of the people, individually and collectively, is not only desirable but necessary to target the areas of governance long neglected by the state.

Till sometime back, we talked of governing as the task of a superior sentient being called the 'government'. This was exemplified and reinforced by discourses, practices and symbols.

The dominant political theory used the term government to refer to formal institutions of the state and their monopoly of legitimate coercive powers. Government was characterised by its ability to make decisions and its capacity to enforce them.

The new governance narrative embodies the assumption that non-government participants have a significant role in the process of governing. This is clearly at variance with the account of governing as the work of government. There has been a change. Once governance was done by the government, now it is sought to be done through a process of negotiation involving non-government participants as well.

The new narrative of participatory government has not been fully developed and practiced yet. It is also now recognized that the governance perspective is date and place specific: That it is not written in stone. Perhaps it is time to do more research and study its robustness

Governance, in our view, is not a static concept. Its institutions, processes and practices change with time and context. It needs to be reinvented, or at least redefined and refined from time to time. However, there are certain characteristics which do not change, like what Sardar said during the debates in the constituent assembly.

Sardar Patel laid the foundation of political democracy in India. He was an important member of the drafting committee of the Constitution. He emerged as an astute leader and wise statesman acknowledged as the Iron Man and a founder

of modern India. It is expedient that we revisit the political values of Sardar in the light of emerging developments.

Sardar Patel had said:

"It is the prime responsibility of every citizen to feel that his country is free and to defend its freedom is his duty. Every Indian should now forget that he is a Rajput, a Sikh or a Jat. He must remember that he is an Indian and he has every right in his country but with certain duties

The main task before India today is to consolidate herself into a well-knit and united power. Caste and community will rapidly disappear. We have to speedily forget all these things. Such boundaries hamper our growth".

In order to pay a humble tribute to the memory of Sardar Patel, this series of annual governance lectures in the name of the Sardar was initiated by the IC Centre. The first lecture was delivered by our Vice President Shri Venkaiah Naidu. While speaking of the features of desirable governance, the Vice President said, and I quote:

"It should be remembered in a rapidly changing world; public institutions cannot remain rigid. They need to suitably change their ways of functioning to meet the mounting aspirations of the people. We have to do away with a lot of outdated and time-consuming procedures and use Information Technology to promote transparency and provide efficient delivery of services".

On the role of the civil servants, he said,

"The bureaucracy must take the lead in the transformation of institutions. These institutions must be the instruments of efficient delivery of public services and socio-economic development. They should have credibility and competence.

I suggest, he said,that we focus on strengthening programme implementation; on building up the competence and credibility of institutional structures and adopting a work ethic that keeps the national interest at the top and public welfare at its core".

For the second Lecture, we looked around and were lucky to find that the best person to do the honour was very close to us.

Padma Vibhushan Dr Krishnaswamy Kasturirangan is an extraordinary man who has been living an extraordinary life. He is an eminent scientist with a keen eye on governance at the policy making level. More than twenty years ago, he explained to me the potential of space research in many areas of public governance and gave me a glimpse into the world of ISRO. Though I have known him for more than two decades, yet I could appreciate the full range of his multifaceted personality only after I followed his eventful journey through his recently published book 'Space and Beyond'.

Dr Kasturirangan was selected for a special task by Vikram Sarabhai in sixties. He built Indian Space Research Organization over the next three decades, acting as its chairman for a decade. Under his able leadership, the space programme has witnessed several major milestones including the successful operationalisation of PSLV and GSLV launch vehicles. And it was not by accident or coincidence that Atal Bihari Vajpayee chose him for the Rajya Sabha; Manmohan Singh handpicked him for the membership of the Planning Commission;and Narendra Modi selected him to draft the National Education Policy. That he was especially selected by successive Prime Ministers speaks volumes of his exceptional intellectual sharpness and accomplishments in every task assigned to him, whether it was ISRO or Karnataka Knowledge Commission or National Institute of Advanced Studies.

We are grateful to Dr Kasturirangan to have accepted our request to deliver today's lecture. I think I should not stand between you and him any longer.

So, I request Dr Kasturirangan to deliver the Sardar Patel Lecture.

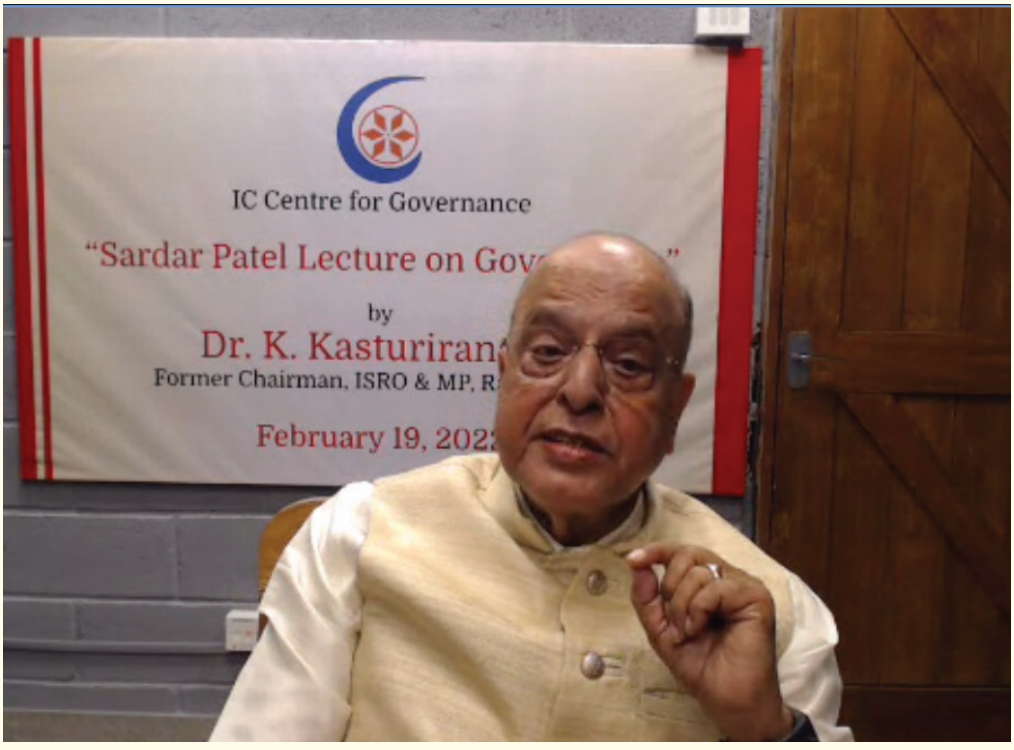
Prabhat Kumar

President, IC Centre for Governance

Address by Dr. K. Kasturirangan*

Former Chairman, ISRO, MP (Rajya Sabha) & Member Planning Commission

A Scientist's Tryst with Governance



Respected Shri Prabhat Kumar Ji, esteemed Shri Mahesh Kapoor ji, distinguished invitees, Ladies and Gentlemen, I am delighted and privileged to deliver the Second Sardar Patel Lecture on Governance.

I am deeply conscious of the tremendous responsibility I have to shoulder in accepting this honour of speaking on a subject relevant to governance, and in memory of one of the most illustrious sons of this country. The maiden lecture in this series was delivered by no less a person than Sri Venkaiah Naidu, our esteemed Vice President, who had a long and illustrious career in governance in various

*Co-authors Prof K R Sridhara Murthy and Prof Viraj Kumar

capacities. It is therefore fair to question whether someone whose career has been steeped in science has the authority to speak on matters of governance. Before accepting the invitation to follow in such hallowed footsteps, I myself pondered this question very carefully.

It is evident that in the present-day context,science and governance have both emerged as decisive influences in shaping our society. On the one hand, scientific research and innovations have become the indispensable handmaiden for good governance, and key determinants for a better quality of life of all. On the other hand, sound practices of governance in scientific research and applications have become absolutely necessary for averting the grave dangers arising from scientific endeavours that lack ethics. There can be no better demonstration of this than the deadly pandemic caused by the COVID-19 virus and its variants across the globe, followed swiftly by the rapid intervention of scientific research and governance to confront this threat. Therefore, I have accepted the task of delivering this lecture out of a sense of duty, to illuminate how science and governance can enrich each other. I have titled my talk as "A Scientist's Tryst with Governance".

At the outset, I would like to express my deep gratitude to IC Centre for Governance for inviting me to deliver this prestigious lecture. The significance of such institutions in a democratic polity needs no emphasis. This centre, through its multifarious activities such as research on governance practices, building policy capacity, shaping civil society role, and creating greater awareness of ethics, has made a mark in the national arena. In all these areas, the life and work of Sri Sardar Vallabhbhai Patel, in whose commemoration this lecture is instituted, can be a beacon to chart our voyage of progress in the high seas of governance. I owe my gratitude to Mr Prabhat Kumar, whose persuasive qualities coupled with his ready acceptance of my suggestion for finalising the topic encouraged me to undertake this lecture. His unstinting commitment to ensure dissemination of the information, about the activities of this centre,to a wider range of intellectual community deserve our deep appreciation. In this context, you may also like to know that a recent book by Shri Prabhat Kumar "Public Service Ethics- Quest for Naithik Bharat" is a very unique discussion about ethics in public service, a subject you don't often get an opportunity to read. This book has a special value in understanding the principles and exceptional thoughts on the subject, based on a very eventful and remarkable journey in public service, of the author.

I may recall that my association with Shri Prabhat Kumar dates back to the time when I was Secretary to the Department of Space and he was the Cabinet

Secretary. Shri Prabhat Kumar's deep insights, into the multidimensional character of the working of Space, and the positive support that he extended to the planning and execution of its activities have had a major impact, on the smooth functioning of the Department. Thank you, Shri Prabhat Kumar Ji.

Sardar Patel had been an epitome of the spirit of sacrifice and stands out as one of the tallest leaders of our nation's independence movement. His contribution to craft a pragmatic strategy and its implementation towards unification of India from more than 550 widely disparate princely states and provincial colonies, his vision to initiate and establish the all India civil services and his humanistic handling of the tragic aftermath of the partition, have all left a lasting imprint in the eventful history of this Nation. In all this, we can see his political acumen, combined with a strong conviction for harmonising conflicting forces. In a broadcast to the nation on 13th November, 1949, he said and I quote,

> ***"The Government, Industry and Labour must all play the game in a spirit of national service... we must have the fullest sense of national emergency; we must close our ranks as we do in the presence of a common danger. Who flourishes if the country sinks into economic slaving? Who sinks if the country prospers? Let that be of our ruling sentiment, let that be our ruling thought."***
>
> **(Unquote)**

We can see that the strength and nobility that were reflected in the character of Patel, is also a reflection of the timeless and life-giving values that we find on the Indian soil, a part of the rich heritage that had been handed down to us. Patel demonstrated through his life, how those values can play a vital role in good governance, without indeed evoking an overt civilizational or cultural accent for his nationalistic ideology. In the stark realities of today's interconnected world and our challenging national landscape of building a secure equitable society, the relevance of Patel's pragmatic and rationalistic approach and the acumen of harmonising diversely complex issues is of a strategic value.

It is a common perception that science and governance are two distinct domains, primarily because only a small group of people are active at the interface of science and governance. However, compartmentalising science and governance can be highly limiting when dealing with new advances in science and its applications.

At the fundamental level, science seeks to explore the unknown and to create new knowledge through the novelty of work carried out by scientists, adding to the existing knowledge base and wisdom. We often call this pure research, to differentiate it from other types of research – applied and translational. While pure research often gets the greatest attention and recognition, its fruits rarely yield tangible out comes that are scalable, with societal, strategic, or commercial impact, unless there is connected ecosystem of applied and translational research.

It is important to note that governance structures that are most conducive for pure research are somewhat unique. The pursuit of pure research (in science or indeed any other domain) necessarily presents a level of uncertainty, randomness and arbitrariness for the uninitiated. To be a source of valuable scientific discoveries, these endeavours often require unshackling the human mind to its full exploratory, creative, and innovative potential. Often, pure research has flourished in environments that encourage unfettered thinking. Thus, the governance structures must recognise that promoting scientists' creativity and originality sometimes calls for a degree of tolerance in enforcing "the rules of the game".

When we move from pure research to applied and translational research, together with associated development programmes, we typically encounter two key differences in the nature of work. First, there is an increasing level of predictability of outcomes, and therefore an expectation of steady advancements. Second, such research often demands major interdisciplinary efforts. For both these reasons, research that is applied and translational in nature, calls for a more conventional governance system. Scientists who have grown accustomed to the relaxed form of governance, appropriate for pure research, may find the transition to a more rigid governance structure difficult. Indeed, a key challenge for India has been to develop a thriving applied and translational research community.

India's space programme is one example, where such a community has been successfully developed. There are key lessons to be learned from this developmental journey that are relevant to a broader spectrum of activities at the intersection of science and governance. The most important of these lessons is that the desired development from pure research to applications does not emerge through a natural process of organisational evolution. Instead, there is a need to design a structured form of governance to deal with issues effectively, and to carefully refine this design over time. At the scale of a handful of institutions, such endeavours can have its own set of rules, which need not be common with full-fledged governance systems as we know today. However, when it comes to national-scale scientific

endeavours like Space or Atomic Energy program, one faces complexities of linking multiple technology dimensions on one side and requirement of large investments as well as human resources on the other side. Further, there is the most important aspect of delivery of assured outcomes.

For India's space programme, the core refinements in governance were conceived and implemented over its first two decades. This critical period spanned the combined tenures of its first two Chairmen, Dr Vikram Sarabhai and Prof Satish Dhawan, and I will now delve into their legacy.

Vision is a basic driver for all human initiatives, action and progress. Vikram Sarabhai's vision for the Indian Space Programme was an extraordinary act of foresight from a scientific leader. To fully appreciate this, bear in mind the relevant historical context: India was facing severe challenges in the aftermath of Independence and the dominant global perspective on space was shaped by the Cold War. It required a truly remarkable mind to foresee that the use of space for peaceful purposes could provide developing countries, such as India, an innovative way to leapfrog the process of development. He recognized that the promotion of space research, besides contributing to societal benefits and enrichment, could also have intangible benefits derived from novel technologies for economic development and security.

Sarabhai emphasized self-reliance, not merely as a promoter of nationalistic fervour, but also as an essential guiding principle for developing technology to suit our own socio-economic and cultural contexts. We are often confronted with situations where the status of our technology lags the global level. Hence, there is a dilemma in reconciling the principle of self-reliance with dependence on foreign sources. The risk of perpetual dependence, coupled with the need for optimally using our human resources potential, was a cause of concern, both for Sarabhai, and later for Satish Dhawan.I shall cite the strategy that Sarabhai and Dhawan adopted to circumvent this, by elucidating India's space communication program.

When India decided to go for space-based communication and broadcast systems, we had to balance the urgency to initiate services in this area, with the long lead-times that designing and developing an indigenous Indian National Satellite (INSAT)would imply. In order to usher India into the era of space communications as early as possible, it was decided to go for a bought-out option for the first-generation INSAT systems. Hand in hand, we embarked on the design and development of the second-generation systems indigenously. Four

satellites of the first generation were thus procured, launched and operated for providing space-based communication and broadcasting services for meeting national needs. It is also of interest to note, that the procurement process and the resultant interactions with the foreign supplier provided valuable insights into the technology of communication satellites with contemporary capabilities. This knowhow in-turn helped to configure upgraded indigenous second-generation systems, cutting short developmental times and the costs to realise the same. This in turn enable the introduction of indigenous second-generation systems into services before the end of operational life of first-generation satellites. This carefully well-orchestrated parallel process, is a shining example of Sarabhai's foresight and Dhawan's organisational brilliance. This strategyhas become a hallmark of ISRO projects through multi, inter and trans-disciplinary approaches.

Let me now return to Sarabhai. In addition to formulating his vision, he also had to conceive a viable strategy to initiate the process. He recognised that science was the seed from which India's initial forays into space could germinate into a programme that provided societal benefits as he had envisioned. He had at least three reasons for taking such an approach. First, being an exceptional scientist himself, he recognised that the Indian scientific research community was a hotbed of innovative and original thinking. Second, by creating first-class experimental science programmes, he knew that he could develop a generation of young scientists with the type of deep systemic knowledge that would be essential to manage complex space projects. By the time I joined such a programme at Physical Research Laboratory (PRL) in 1963, he had already mentored a superb cadre of senior students who had started playing key roles in the early phase of India's space programme: Prof E. V. Chitnis, Prof P. D. Bhavsar, and Prof U. R. Rao among others. Third, Sarabhai could leverage his extensive contacts within the international scientific community, including top scientists at NASA and MIT, that enabled him to pick the brains of some of the best minds to bring in innovation and creativity for India's early space endeavour. PRL provided Sarabhai an academic platform to invite such experts, and it is therefore recognised quite rightly as the cradle from which our space programme emerged.

To give you just a taste of this exciting moment in time, allow me to share some of my personal experiences. Because of my strong interests in Physics, I was naturally thrilled to have an opportunity to carry out research on Cosmic X-rays under the overall guidance of Dr Vikram Sarabhai. As I was being interviewed for the position, Sarabhai summarised his vision for India's space programme. He

stressed the experimental nature of the research I would be conducting. Our goal was to design and test new instruments that flew to the edge of space, initially using high-altitude balloons, but later using rockets. From this vantage point, these instruments had an opportunity to advance science by observing phenomena that cannot be detected from the ground because of the blanketing effects of the atmosphere, or for reasons of in situ measurements.

I may mention that practicing research can contribute to the development of key abilities in an individual. Among other things, research kindles originality, creativity, an innovative approach to looking at the world, an ability for out-of-the-box thinking, and an approach to coping with increasingly complex problems. Further, research methodology often calls for looking at a particular problem with all its multiplicity of dimensions, without which one cannot comprehend the complete picture. To give you an illustration, when I wanted to understand cosmic radiation from outer space for my research, I had to grasp the nature of radiation, its transmission, techniques of detection and the models of the universe that can explain the phenomena. So, there is a whole host of disciplines and approaches like physics, astronomy, experimental techniques, developing precise communication abilities and team work – all brought together to design a set of experiments to explore scientific phenomena of interest. This is precisely the type of systems thinking that Sarabhai was seeking to inculcate. Now, decades later, we have echoes of his vision in the National Education Policy, which stresses the importance of liberal education.

Even as Sarabhai actively mentored the scientific activities that seeded the space programme, many of which had a pure research flavour, he worked tirelessly on laying the foundations for the next phase. At the time, there were very few benchmarks for applied and translational research programmes, and Sarabhai further recognized that India lacked an industrial and academic system capable of providing supportive linkages. Therefore, he began to develop the nucleus of a new culture where a large group of individuals, trained in diverse activities but well-versed in working in teams, could drive the transition from space science to space technology and its applications. He set up the Indian National Committee for Space Research (INCOSPAR) in 1962, which took over the responsibilities for space science and research from the Department of Atomic Energy. Under Sarabhai's leadership, INCOSPAR started establishing core capabilities within specific institutions, including Thumb a Equatorial Rocket Launching Station (TERLS), Space Science and Technology Centre (now Vikram Sarabhai Space Centre) in

Thiruvanathapuram for launching sounding rockets as well as developing launch vehicles and early satellites, Experimental Satellite Communication Earth Station (now Space Applications Centre) in Ahmedabad for satellite communications and remote sensing, and a satellite tracking station at PRL itself. In 1969, INCOSPAR was superseded by the Indian Space Research Organisation (ISRO), with Sarabhai as its first Chairman.

Central to Sarabhai's unique conception of the use of space, were nationally important applications such as direct satellite television broadcasts for educational purposes, improving meteorological forecasting (which is critical for agricultural operations), and conducting resource surveys to support national planning. He surveyed the landscape of such applications with a keen eye, and he initiated investigations into all potential applications that could be feasibly validated. However, as yet another example of his tremendous vision, he recognised that it was not enough to merely demonstrate technical feasibility, in isolation from the community of users that the applications targeted. He stated, (Quote) "It is possible to develop atomic energy and space research through basic, applied and developmental research in islands, largely isolated from the rest of the country, but large-scale applications of either, for the benefit of the nation cannot be undertaken in isolation." (Unquote) Thus, he initiated a major national-level consultation with user agencies outside the space system. It is among this crescendo of effort, taking ISRO to the cusp of its next phase, that Sarabhai's life was tragically cut short in December 1971.

In the immediate aftermath, Prof M G K Menon took over as Interim Chairman. One key step (among many)that he took at this critical juncture was to organise a seminar as a fitting finale to Sarabhai's initiative to embark on a national consultation to utilize space capabilities for national development. This was held at Ahmedabad in August 1972 and attracted over two hundred participants representing 78 different Organisations, Agencies and Institutions. They jointly identified critical programmes and projects of relevance to the country. This seminar helped to reemphasize Sarabhai's legacy of creating a powerful culture of inter-departmental work among these stakeholders. This culture, that places the user community of space applications at the core, continues to remain intact at ISRO today.

After Menon's brief tenure, the mantle was passed into the capable hands of Prof Satish Dhawan. It was Dhawan who accelerated the process of consolidating the diverse sets of activities that had been initiated previously, giving them an

organisational focus. Dhawan's tenure from 1972 to 1984 was marked by three phases in the evolution of India's space program. This phased strategy is akin to modern approaches of risk management for large techno-social systems by a stage-gating process. I will now describe these three phases in some detail, along with the associated evolution of the governance structure that prepared the programme for its next phase.

During the first phase, Dhawan quite naturally focused on completing the proof-of-concept demonstrations for activities that had been conceptualised and initiated under Sarabhai. However, he was not simply dotting i's and crossing t's, but energetically creating a working environment attuned to the complexities and challenges ahead. As an illustrative example, consider the development of Satellite Launch Vehicle,SLV-3. When Sarabhai had initiated this project, he was hand-holding his group through the process of vehicle development by adopting a configuration similar to the 4-stage American Scout rocket. In an effort to maximise learning in the least amount of time, Sarabhai had consciously split the group into four teams, one for each stage. By the time Dhawan took over, the downside of this structuring was evident: integrating the designs of four separate teams into a single system was proving to be immensely challenging. Dhawan could have narrowly focused on addressing only the immediate challenge, but that was not his style. Instead, he crafted a permanent solution to the systems integration problem at the governance level. In the case of the SLV-3 project, this involved identifying a person to whom the overall responsibility of the vehicle could be entrusted. The man he selected was none other than Dr A P J Abdul Kalam.

Other key projects that Dhawan led to completion during this first phase included Satellite Instructional Television Experiment (SITE) involving the ATS-F American satellite, Satellite Telecommunication Experimental Project (STEP) supported by the Anglo-French Symphony Satellite, and applications development involving images obtained from American satellite LANDSAT. These demonstrations enabled ISRO to evaluate the potential of Space as a vantage point for addressing the country's developmental needs, as well as issues of scalability at the national level. An important outcome of this first phase was the validation of the uniqueness of space in providing new services, as well as assessing the advantages beyond the conventional approaches. Further, this phase offered a low-cost strategy for evaluating the concepts, the systemic issues including technologies, the institutional frameworks, and the user interfaces.

Turning to the organizational systems, an important mechanism that created

integrated focus and multi-disciplinary leadership was through setting up a high-level body in 1972 known as the Space Commission, which oversees and guides the space program in India. It is pertinent to quote here from the resolution relating to the constitution of the Space Commission which inter alia states, (Quote) "the technological advances in the field of space, which are based on developments along advancing frontiers of many areas of science and technology produce rapid obsolescence not only of tools and equipment but also established systems of organisation. The sophistication of this technology, the newness of the field, the strategic nature of its development and the many areas in which it has applications have to be borne in mind in developing a suitable organisational framework to handle this area on behalf of Government". (Unquote) The resolution also noted that in order to promote a rapid development of activities connected with the Space Science, Space Technology and Space Applications, the government considered it necessary to set up an organisation, free from all non-essential restrictions and or needlessly inelastic rules, which will have a responsibility in the entire field of science and technology of outer space and their applications. The Space Commission is chaired in ex-officio capacity by the Secretary to the Government of India in Department of Space, and it reports directly to the Prime Minister. This structure ensures that the space program derives strength from the highest level, and that policy directions are duly integrated by different government agencies.

Dhawan now turned his attention to the next phase, which dealt with the realization of end-to-end systems at an experimental level. Even as he did so, his foresightful mind was already envisioning ISRO's third phase of sustained operations and growth, which would largely occur after his tenure ended in 1984. Thus, in parallel to activities in phase 2, he was further refining the governance structure, and the success of the third phase rests on the strong foundation he laid in the latter half of his Chairmanship. I will describe these parallel efforts next.

In Phase 2, there was a marked shift in strategy to develop in-house experience in the end-to-end realization of space systems whose potential utility at the national level had already been clearly demonstrated in Phase 1. Examples from Phase 2 include satellite missions such as Bhaskara and APPLE (Ariane Passenger Payload Experiment), and the development of space launch systems: Satellite Launch Vehicle (SLV) and Augmented Satellite Launch Vehicle Systems (ASLV).

Thus, Phase 2 sought to build heritage in space prior to operational deployment. This is a widely respected practise, which duly recognizes that space systems are inherently complex, carry high risks and are investment-intensive. There was also

a need to minimize the impact of probable early failures in the public mind and the political system.

Many of the techniques that have uniquely evolved for space endeavours reflect principles of sound governance. Dhawan introduced several of these, starting early in his tenure with a effective review system with clear accountability and numerous checks and balances.

During the execution of complex space missions and projects, uncertainties that arise often call for mid-course changes, which affect several segments of the complex system. Configuration management techniques and practises have today become relevant for socio-economic development activities that are invariably multi-disciplinary in scope. For governance practices which need to address multi-stakeholder interests and interrelation among cost, schedule and performance for evaluation of impact of mid course corrections, configuration management techniques are highly relevant. The early adoption of the principles of configuration management is a high point of ISRO's management practices in different projects.

Global experience with structuring of enterprises in the modern knowledge era indicates a preference for project-oriented matrix structures where the water tight divisions of functional departments are transcended and flexible team working can be enabled focusing effectively on the outcomes desired. Many professional leaders of today adopt interdisciplinary and mission working to realise outcome targets relevant to governance. There is tremendous need for such organisational innovations in governance, which need to be studied and adapted or modelled for practical use. In big scientific endeavours, a structured way of getting things done with well laid out rules and with a well-defined scope of financial control, management of the configuration of deliverables and schedule control need no emphasis.

In the governance relating to the introduction of high technology systems for meeting developmental and other innovative service goals, pragmatic strategies are called for. In the journey that India undertook in transforming her to a major space power, the strategic outlook was an essential navigator. In the first place, there was a detailed assessment and evaluation of alternate approaches to arrive at the most optimal solutions. Secondly, there were timely and deliberate decisions on exercising buy or build options considering the time frame for the introduction of services. In fact, the option whether to buy or to build was often/always part of the original design, at the system or even subsystem level, retaining the greatest

level of flexibility. In the case of buy options, a parallel indigenous development plan was created to achieve self-reliance goals.

You may recall the trade-offs I had spoken of earlier for space-based communication and broadcast systems. For earth observation systems, Dhawan required a different strategy. Although foreign satellites such as LANDSAT were being used for developing remote sensing applications in the country, the special requirements of earth observations peculiar to our country, as well as cost and strategic considerations, called for an indigenous design and development route for the realization of operational remote sensing satellite systems. The implementation strategy that Dhawan put into place involving many original concepts and innovation relating to overall satellite optimization, payload design particularly optics & detectors and other satellite elements helped India gain a pre-eminent position in the field of remote sensing satellite systems.

Launch vehicle technologies play a seminal role in providing autonomy for access to space. In terms of the complexities and the barriers that exist internationally for the technology flows, space launch vehicles experience a higher degree of constraints in comparison to satellites. Therefore, even though we embarked on developments of both satellites and launch systems at the same time, it became necessary to make these two streams of development to proceed independently. India consciously decided to seek launch support services for operational satellites from outside agencies as the development of suitable launch vehicles were still under progress. Such a strategy enabled the timely establishment of space services and also provided specific inputs for sizing the launch systems for these classes of satellites.

An aspect of the organisational strategy was to create an industrial base for supporting the space programme and for carrying out relatively routine operations. Sarabhai, being an industrialist as well as a scientist, had leveraged his ties to industry for creating ground systems and certain aspects of space systems. Under Dhawan, the space agency concentrated on pushing the internal output to move up in the value chain. This meant enhancing the quality and content of R&D outputs. This also enabled us to progressively increase the strength of highly qualified professionals without increasing the overall size of the organization. Also, in successive five-year plan periods, the organization could deliver increasingly larger number of complex missions, thanks to the increasing involvement of the Indian industries.

Dhawan also spearheaded several innovations that supported ISRO at an organisational level. Experience from earlier experiments involving broadcasting,

communication and remote sensing, and dealing with the user communities, provided valuable inputs for the creation of innovative formal institutional frameworks. In the case of remote sensing, the institutional framework involved setting up of the Planning Committee of the National Natural Resources Management System (NNRMS) in 1983, which at the overall level is mandated to provide directions for the creation of space based remote sensing capabilities for the country. NNRMS consists of Secretaries of the line departments of the Government of India dealing with natural resources. It was initially headed by a Member of the then Planning Commission. Such a structure enables the involvement of major user communities to address issues of ensuring the use of such systems in their own areas of thematic applications, while at the same time facilitating the incorporation of this new and powerful technique into conventional approaches. Similarly, the INSAT Coordination Committee, with the Secretaries of the user departments (Information and Broadcasting, Communication, Information Technology and Science & Technology) working along with the Secretary of the Space Department, was created as an apex body to address the development of space communication, broadcasting and meteorology and planning their utilization. In the context of Space the Advisory Committee on Space Sciences (ADCOS) represented by some of the leading space scientists in the country provides directions for space science research. These three unique structures were masterminded by Dhawan, and they have played a crucial role in sustaining the various space endeavours. Being user-driven further emphasises the culture of accountability, and a focus on efficiency.

In a conflict-ridden world swayed by the forces of globalisation as well as diverse geopolitical and nationalistic interests, the roles and the actors of space activities are rapidly transforming in the global arena. The strategic role of space in security, human and robotic operations in space and exploration of planetary bodies, and management of space environment for safe, secure and sustainable uses are receiving priority. We see larger roles for private sector actors, and disruptive developments are to be expected. This overall change in environment calls for a renewal of our approach to governance in space. Developing a national ecosystem for future advances in space must now be considered a priority.

In the context of enhancing space endeavours in the years to come, there are also needs and opportunities to strengthen and enhance the role of strategic, commercial and international cooperation/collaboration. In this context, there is a need to examine models that can address meeting demands on increased financial

and other resource inputs. One major step in this direction is to address private sector participation, not only in the provision of downstream services, but also in owning and operating satellite systems as well as providing launch vehicle services. This would need consortia of industries coming together to produce state-of-the-art, cost competitive satellites on one hand, and manufacturing launch vehicles and providing launch services on the other hand. Needless to emphasize, there are issues related to technology transfer from ISRO, the use of ISRO infrastructure for testing, and other related requirements of launch vehicle and satellite manufacture, the use of launch pads and auxiliary services to provide launch services through private entrepreneurs, apart from issues relating to confidentiality and national security. It is gratifying to note that many of these developments related to national and international space endeavours and the resultant needs of transformative changes have been recognised by the government and the recent restructuring of ISRO by the present Government is a welcome step in this direction. A major initiative is needed from the private sector, with the enabling role of the government. Further, the increased role of space systems in the strategic sector is yet to display its full potential. It is necessary to evolve a comprehensive policy and programme relating to national security with space systems playing an appropriate role. Towards the end of the last decade, the world has witnessed the induction of the Space Force as one of the independent service branches of the US military. The breakthrough in reusable launch systems, the aggressive role of the private sector in the US disrupting the balances hitherto in the markets, the phenomenal investments in space capabilities from our region, all call for a strategic response from India in the new era unfolding in the space arena.

Another dimension of increasing the level of space endeavour in the country is to increase bilateral and multi-lateral cooperation, particularly for science missions. Evolution and expansion of this strategy could see India playing an increasing role in manned space missions, creation of space habitats, lunar bases and planetary exploration; all within the ambit of a global partnership framework like the model followed for International Space Station. Further, India could also play an effective role in global missions relevant to disaster management, monitoring climate change, space traffic management and such emerging concepts.

Regarding the international dimensions of space, with a unique legal regime that considers activities in outer space as a common province of all humankind, and allows all states to freely explore and use any part of outer space including the Moon and other celestial bodies, the domain of outer space has witnessed many unique acts of cooperation at the international level. At the same time, due to its

strategic and economic importance, it had also triggered intense competition for the use of resources such as orbit and radio spectrum in certain preferred ranges. On balance, however, the inherent unifying influence of space and its ability to convey interconnected ness of all human actions on Earth had been powerful enough to inspire a new culture that has enabled human minds to transcend their exclusive earthly image and engage in expansive visions of space travel, living in outer space, and emerging as a multi-planetary species.

I would like to conclude my talk by making some comments on Science and Governance- a partnership in progress. With the growing progress in human civilisations over the past few centuries, which is equally tempered by the great wars and other upheavals, a new trend of universal and over arching humanistic values as a basis for social, political and cultural movements is manifesting. These humanistic values transcend national boundaries and connect all humanity. As a system or a discipline, the governance should draw its vital strength from these trends of reawakened humanistic values based on the recognition of the rights of all people including those who are disadvantaged or marginalised for access to livelihoods, equality and justice. Secondly, there is the priority need for renaissance in governance, for enabling it to synchronise harmoniously with the culture and methods of science which are strongly influencing the pathways traversed by societies in quest of further progress. Without such renaissance, modern challenges like climate change cannot effectively be confronted. Further, the governance systems should recognise the realities of the increasingly interdependent nature of the world, resulting from the forces of globalisation and also the imperatives of the natural world that we live in. India has been a land for time tested values that indeed address all humankind with their universal outlook and limitless magnificence of human potential. These values need not be in contradiction to the scientific outlook and techno culture that dominate the environment of our times but more importantly that can be vital forces to ensure beneficial coexistence and growth in the order of a stupendously diverse world. In this context, the values manifested through the life and actions of tall leaders like Shri Sardar Vallabhai Patel stand as a strong testimony for the relevance and vitality of such values as the life-current of good governance. They continue to serve as our beacons for our future journey of progress.

I would like to express my grateful thanks to Prof K R Sridhara Murthy for his help in developing this manuscript and Prof Viraj Kumar for critically reviewing the same.

Let me take this occasion to heartily wish you all good health and progress. Thank you

VOTE OF THANKS

Thank you, sir, for a most insightful lecture. It has covered a large canvas from the vision of Dr Vikram Sarabhai to the organisational skills of Dr. Satish Dhawan. It has covered the bringing together of Science and Governance, the interdependence in the world we live in, the environmental concerns all which require the need for a scientific Outlook in the bringing together of desired issues and the outcomes.

It has been a brilliant lecture and I thank you once again for being with us to deliver the second Sardar Patel Lecture on Governance. I also thank all the participants from all over the country and abroad.

Mahesh Kapoor

Vice President, IC Centre for Governance

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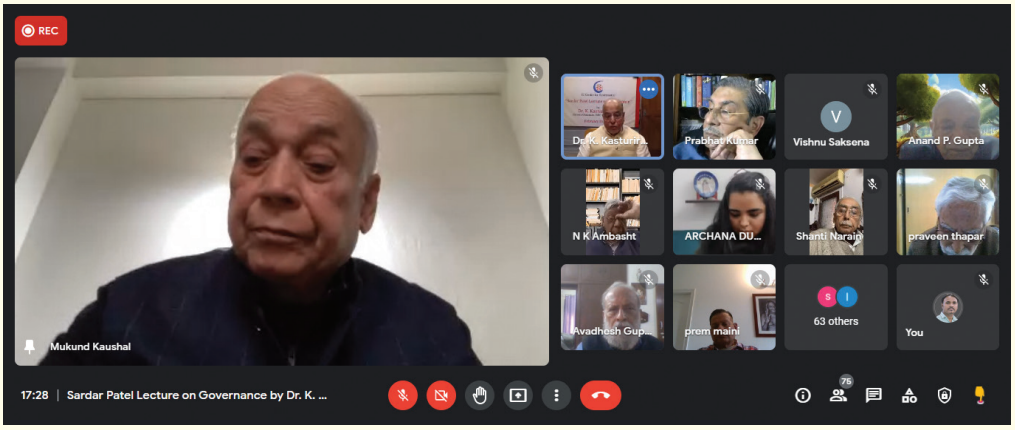
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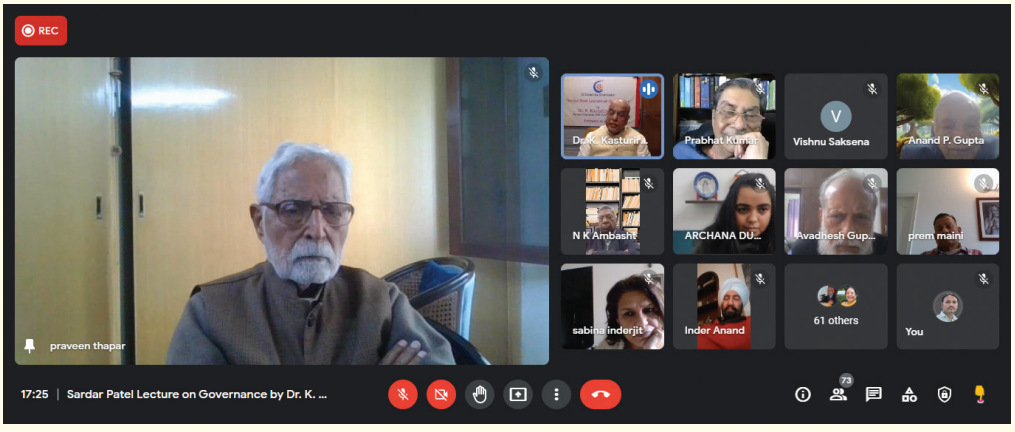
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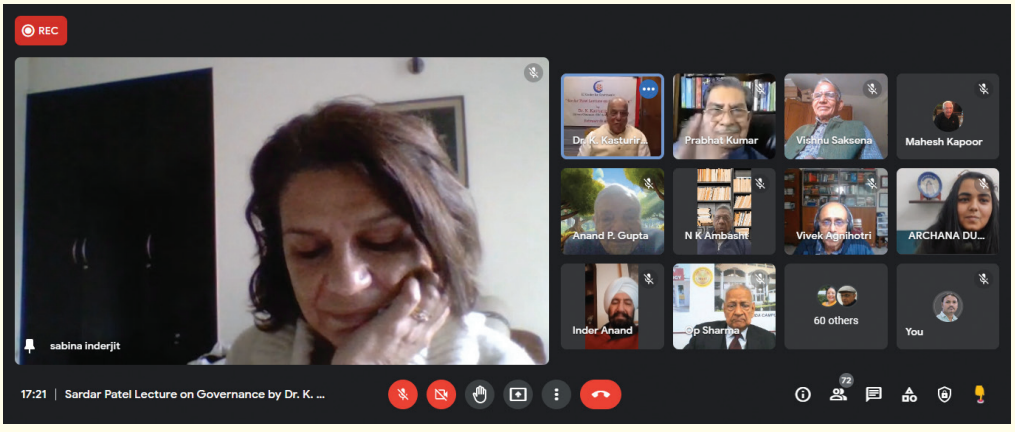
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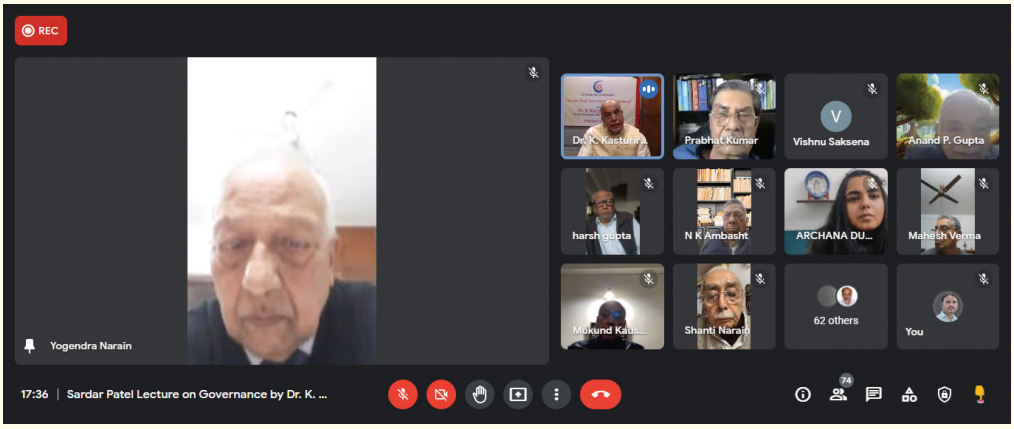
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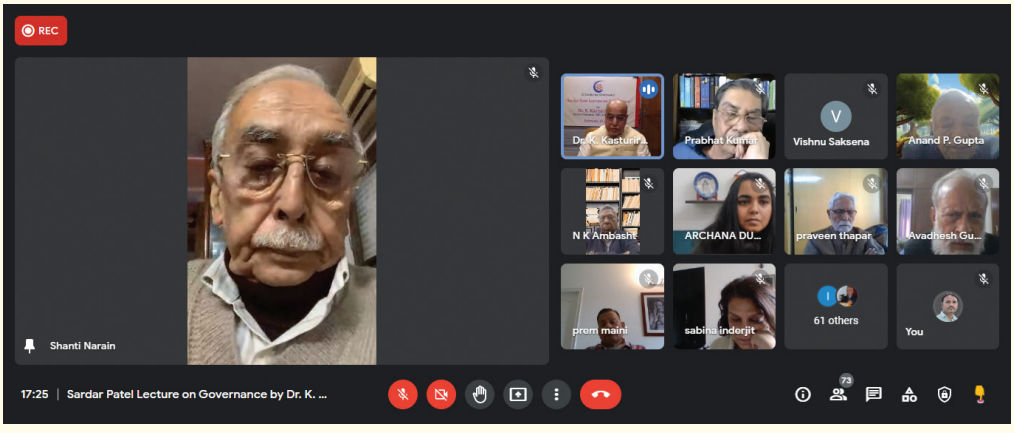
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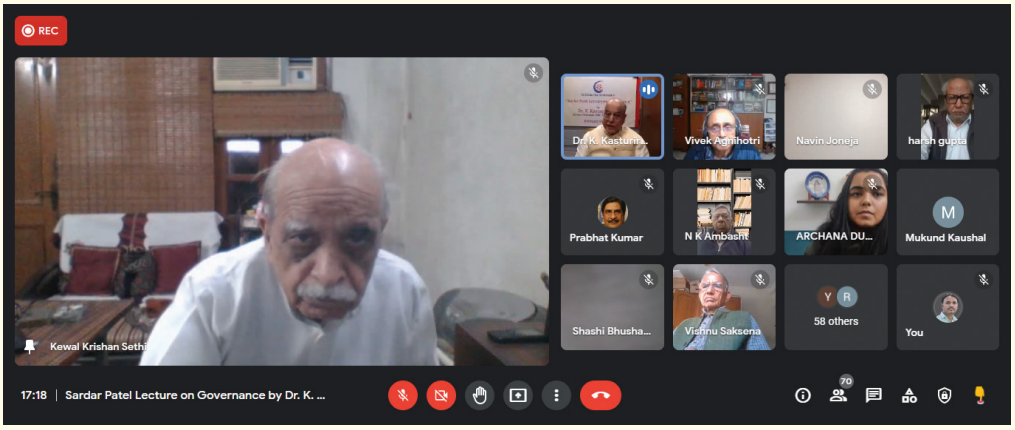
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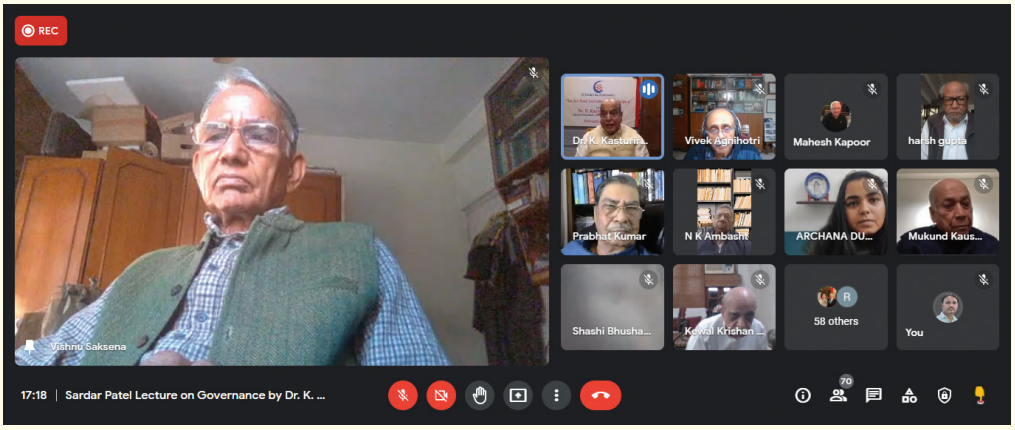
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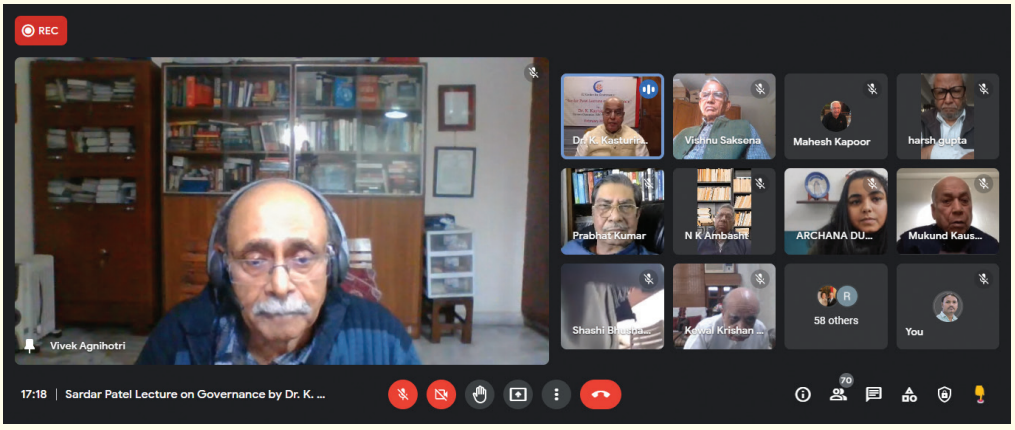
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