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Planning Research in Science and Technology for the Future – An Indian Perspective

Whereas research, development and innovation in developed economy is driven by private sector investments with a share of about 1.2 to 1.3 % of GDP focusing on market competitiveness and private good, the Indian innovation landscape is predominantly driven by public funding with a 74% share of the total investment leading to focus on public, social and strategic good to reach a wider section of the society.

The research and developments in India are coordinated through seventeen departments. Several mechanisms exist for coordinating plans between the ministries while maintaining their independence in terms of achievements and accountability. The Department of Science and Technology (DST), the Department of Biotechnology (DBT) and the Department of Information Technology (DIT) receive almost 70% of the extramural investigator centric and basic research. The mission oriented Departments such as the Department of Defence, the Department of Atomic Energy and the Department of Space support research through intramural research predominantly. The DST and the DBT are run on the lines of the National Science Foundation and the National Institute of Health in the United States. The DST and DBT also follow the same rigour of NSF and NIH in terms of peer review and monitoring of the projects. More recently the DBT has also been successful in supporting translational research besides supporting fundamental R&D. Both DST and DBT have shown an annual growth of 20-30% per year in the last five years. Further, the ministries also come up with national initiatives which address the nation's aspirations to be a world leader in some of the emerging areas. In these areas both capacity and capability building with a long range focus have been the major drive. A few such examples include the initiatives in nano science, cognitive science, security, combustion research, supercomputing, stem cell research, systems and synthetic biology, open source drug discovery, earth systems science and energy.

The management of science in India rests in the hands of renowned and accomplished scientists who receive intellectual inputs from various advisory councils such as the Scientific Advisory Council to the Prime Minister, the Scientific Advisory Committee to the Cabinet and the National Innovation Council using a collegium approach.

There is a wide recognition in the country that the next wealth generating engine of growth will be based on knowledge derived from S&T innovation. India has declared 2010 to 2020 as the Decade of Innovation. Our 12th Five Year Plan (2012-2017) aims an increase of R&D gross expenditure of GDP by 55% to 1.55% of the GDP. The planning process is also looking at providing policy stimulants for doubling the engagement of private sector in R&D.

The private participation is pursued from two fronts. The first is through International S & T Collaboration. The strategic initiatives in science and technology through international S&T based on the principle of reciprocity and parity is vigorously pursued. The process of selecting the collaborative projects and mechanisms hinges on joint calls, joint peer review and joint monitoring. One of the recent initiatives is the creation of the Joint Centre for Clean Energy R&D with the United State. Under this Centre a 100 M$ fund has been set up. (25 M$ each from the Department of Energy (US) and the Department of Science and Technology (India) and 25 M$ each from the American and the Indian industries).

India realizes that the absorption can only be successful if the private sector involvement into R&D is significant as in the developed countries. The focus of science and technology elsewhere in the world is towards maximization of the benefit. Indians all along have been focusing their work towards optimization of resources and have demonstrated repeatedly that their research purpose is to reach as many people as possible. It is worthwhile to note that 63% of the children's vaccine is produced by India and this is not due to labor arbitrage but due to the low expertise cost and residual idealism among the youth. Hence our model of involvement of private sector through international S&T collaboration is likely to combine the experience of the two cultures to result in affordable, equitable and economically attractive innovation.

The Prime Minister's Council on Trade and Industry constituted a subcommittee which came up with a concept paper on Private-Public-Participation (PPP) in R&D for clean energy. The interfaces between academic research, government, society and private sector in India are weak. The vertical silos do exist and the integration is lacking. In order to overcome this weakness the landscape was modeled as a transition from knowledge to know-how, from know-how to show-how, from show-how to do-how and, from do-how to use-how. In this landscape know-how to show-how was found to be somewhat weaker. A new concept based on a relationship model instead of the transaction model is being proposed. A joint venture between the private sector and the public sector will be created to fund research for public and social good in the areas of agriculture, water, energy, environment and affordable health care.

The Government of India is also sensitive to global concerns such as energy, water, terrorism and climate change. A 40 Billion $ solar energy mission has been started to demonstrate the sensitivity of the country to global climate change, and to come up with viable solutions to balance between developmental aspirations of India and the differentiated responsibility of India to control emission and mitigate climate change.

While the country has been planning on a massive expansion in R&D, the system needs adequate preparations to generate the required absorption capacity. In the last few years, the education system in India has been put on an expanding phase. The youth enrolling into education is ramping up. The gross budgetary support for education in India is 19.8% taking into account of the quadrupling of the number of youth enrollment into education over the past 15 years. During the Eleventh Five Year Plan (2007-2012), the budget for tertiary education increased by 9.1 times and the annual growth of investments in tertiary education has sometimes been more than the budget of some of the science departments.

In order to enrich the R&D capacity of India, an innovative programme called Innovation in Science Pursuit for Inspired Research (INSPIRE) has been mounted for attracting talents for study of science and careers with research. It is a billion dollar initiative and it has already attracted 0.6 Million youth in the age group of 10-32 years to the science sector.

There is an evidence of positive effects of Indian investments into R&D sector, as seen from a 12% annual growth of scientific publications, a 11% increase in citations, greater than 20% increase in patents, and the improvements in the relative ranking in terms of the number of publications in the world from 15 to 9 during the last five years.