

Technology and Innovation

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The larger share of public investments into R&D could also be leveraged by focusing of R&D for public and social good priorities of the country

THE ABILITY to innovate and deploy globally competitive technologies has been recognized as the next key driver of global economic change in the emerging knowledge economy. While science is scholarship driven, technology and innovations are market and competition driven, respectively. Currently, Indian Research and Development landscape is largely influenced by the character of public funded research and selection of R&D priorities is mostly supply driven. The private sector investments into R&D have been marginal. Therefore, demand driven component of R&D goals has been limited. Policy, strategy and tools are required to stimulate larger investments into demand driven R&D goals. Energy sector invests far too low into R&D, although industrial turn over in the sector is extremely high. Promotion of Public-Private Partnerships into R&D and clean energy is a critical component of India's competitiveness in global trade and industrial growth. New strategies and tools are required to

stimulate engagement of private sector into R&D and enhance the share of private sector investment from the current 26% of India's R&D spend to at least 50% during the 12th plan period.

The larger share of public investments into R&D could also be leveraged by focusing of R&D for public and social good priorities of the country. There is an un-tapped opportunity for India to emerge as a global leader in affordable innovations under PPP by focusing on R&D for public and social goods in the areas of agriculture and food security, water, energy, affordable health care, education, environment, renovation of urban infrastructure, S&T inputs to rural development etc. Residual idealism among the youth and vast talent base offer an opportunity for the R&D sector in the country to gain leadership in affordable and social innovations. The Twelfth Five Year Plan should lead to the creation of an innovation ecosystem most suited to the developmental phase of the country. Such an ecosystem should be complete with new

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responses to risk averse nature of the society, delivery models for innovative deployment of technologies, business models for financing deployment of innovations and adjustments in governance and management models for supporting strategic goals of innovations. The approach for R&D sector should address all stages of life cycles of ideas; from creation to commercialization and value creation. This would call for paradigm shifts in approaches of planning for R&D in India during the Twelfth Five Year Plan period.

A paradigm shift in approach for the Science and Technology sector is required to focus on an output directed development path strategy rather than the present input driven model. Such changes are essential for making a tangible and traceable change in the socio-economic scene of the country. While basic research would need necessarily an input-led growth path, differences in approach through output directed model would be required for connecting knowledge and wealth generating activities of the country. Supply side approach for promotion of advanced basic research should be further enabled with tools for demand-side planning for innovations and technology development.

The structure and work culture within the R&D sector in the country are supportive of transactions of knowledge for money and technology transfer ideologies. Success of this model has been limited so far. In the selection of R&D priorities and goals, strategic approaches and time

bound delivery of outputs are not generally factored into. Whenever the participation of the user sector in selection of R&D priorities has been ensured, the usability of the R&D outputs increases significantly, a relationship model involving all stakeholders engaged in the conversion of concepts into commercial realities has been far more successful than the transaction models deployed in the R&D sector in the country. Several countries have successfully developed relationship models to connect R&D outputs to national goals and economic development processes. Israel is highly successful in creating wealth out of innovations. The approach of the Twelfth Five Year Plan for the R&D sector should adopt such global best models for leveraging R&D outputs for national economic development. Below are some strategic concerns that needs to be addressed for strengthening the eco-system and the proposed approaches for the way forward:

Enrichment of knowledge base

Natural evolution of Basic research in India during the last three decades is inspired by the directions and priorities of the industrialized world, but without the matching linkages among academy-research and industry. Various factors have limited the global competitiveness of India in basic research. Various factors have limited the global competitiveness of India in basic research. Although there are some general improvements during the Eleventh Five Year Plan period with respect to publications and patents on account of several

measures. Indian basic research has been mostly supply driven rather than catering to the increasing demands; both in terms of quantity and quality. Indian systems for supporting basic research has so far not adopted adequate measures for promoting institutional joint collaborative research with active schools in the global scene in futuristic frontier areas of science. The multidisciplinary approach towards solving India relevant specific problems as challenges needs to be undertaken in a systematic manner.

The approach therefore should be to (i) reduce the artificial divide between academic teaching and research institutions in India, (ii) spot, attract, nurture, and encourage sparks and talent in scientific research from under graduate to post graduate research through a lifelong learning approach, (iii) Identify areas of national interest, gaps for promotion of basic research and improving the quality of science education, (iv) focus on oriented basic research for meeting the national priorities on food and nutrition security, affordable health care, water, energy and environment security etc., (v) Incentivize the sharing and collaboration of multidisciplinary approach to enriching the knowledge base through the global integration, and (vi) participate in Global Research Consortia in creating mega facilities for basic research.

University, industry, and Scientific Establishment Collaboration

India has the third largest education system in the world. A

conducive research sector requires cutting edge research universities, industrial R&D Centers and a network of Government Laboratories with well-maintained infrastructure and liberal funding, working together towards defined objectives. Further, effective mechanisms of collaboration need to be created for universities and industry bodies so that research output and innovations can effectively be commercialized and transformed into marketable products and services for last mile benefits.

The approach therefore should be to (i) encourage universities and research centers to focus expertise and resources on key industrial focus areas, (ii) encourage flows of knowledge, created by universities and scientific research establishments, into industry, (iii) help universities create industry-ready talent pools, with practice-relevant skills, (iv) use university expertise to upgrade industry talent, (v) encourage universities and industries to apply faculty expertise in specific, operations-relevant problem areas, (vi) synergize the expertise in universities and research establishments – in areas such as manufacturing, ICT, and industrial management – to enhance the efficiency and productivity of existing industries (vi) identify, develop, and scale programmes and projects (such as new research parks) that draw on and synergize complementary capacities within research institutes and the private sector (vii) draw on industry practitioners' experience and expertise to develop and advance research objectives at

scientific establishments, teaching curriculum development and upgrades at universities, and (viii) utilize industry infrastructure for upscaling of technologies.

Incentivizing R&D in Public and Private Sector

There is an urgent need for attracting larger investments of private sector into R&D. Whereas the private sector investments into R&D in most globally competing economies are in the range of 1.2 to 3.0% of GDP, the corresponding investment of the Indian private sector never exceeded 0.2%. While public funded institutions are generating technology leads from Public funded R&D, the levels of utilization of such technology leads by commercial enterprises have been limited. The present models of research funding by and large in the country do not facilitate the venture funding of translational research in the private sector, whereas several global models do so. Current fiscal incentives for attraction of investments into R&D by way of tax benefits have lead only to marginal results and the linkages between academia-research and industry remain under developed and weak. The investments into/ by the Public Sector Undertakings for R&D have also been much lower than desired. The State led stimulus for innovative products through procurement guidelines, technology acquisitions or facilitating FDI in research in the country has not been explored adequately. The systematic encouragement to the Indian diaspora also has not been fully exploited. Stimulation of the

entrepreneurial environment, reduction of the stigma on failure, a strong angel and venture capital supporting system to back up innovations and access to assured market for products of innovation are some key elements of a well designed innovation ecosystem. The Twelfth Five Year Plan programmes of R&D sector should look beyond the generation of technology leads, patents and intellectual products. It should design and position sufficient incentives for not only R&D but also for the utilization of R&D results leading to an economic outcome.

Conclusion

There is therefore a need to create a vibrant landscape of Public-Private Partnership and an enabling framework for attracting investment from the industrial sector, both public and private sector into R&D system and incentivize the same for linking development with technology sector. This would include: (i) creating early 'trial' markets around national priorities and allowing private firms to recoup investments in R&D (ii) helping private companies access the best technical resources – increasing the chances of R&D success, reducing uncertainties, and incentivizing investment, (iii) enabling public and private sector companies to overcome risk in commercialization and value capture and (iv) making regulatory frameworks less complex, and more facilitative, for technological innovation in the industrial sector. □

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