Institutional settings of a triple helix: Industry - R&D institution – University cooperation for effective technology transfer – an Indian Experience

by

Subrata Banerjee†

S Y N O P S I S

Technology is usually approached as a commodity to be transferred from one place/group to another place/group. But the processes involved in the generation of technology up to its utilization are much more complex. The motivations for utilization of technology also vary. Only when we understand the complexity in its totality, we can address the crucial issues and find solutions for the problem.

Though the words *know how* and *know why* are often used to the point of becoming clichés, it is not easy to transform knowledge as available in public domain or that is available through contractual arrangements like operational manual, special reports etc. into actual technology commercialized. It is obvious that technology transfer cannot have one fixed rule or methodology. It will vary depending on the nature of end uses and knowledge base, the point of innovative cycle or industry cycle at which we start the efforts. For example, if one is to work on surface treatment of a material or a bio-technological process or a software approach in which very little has been done in by the leading companies or laboratories worldwide, one would also be mostly in the invention/ innovative phase. That is one will be at the cutting edge or in the frontier. In such cases, considerable R&D will have to be done even if the efforts of up scaling engineering etc. are done in concurrent engineering mode. On the contrary, if one deals with an area in which industries and technologies are mature and also where economies of scale are very large, such efforts will be to absorb technologies effectively to reach world standards of performance as well as plan for a few areas where there is an in built competitive edge. It also needs to be realized that there are many problems unique to the Indian conditions for which nobody has immediate solutions or ready technology package. In addition, we have to deal with the prevailing social situations around ourselves.

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† Scientist G, Department of Scientific and Industrial Research, Ministry of Science and Technology, Government of India , Technology Bhavan, New Mehrauli Road, New Delhi 110 016, India. subratb@nic.in

Due to increasing global competition, the period of product or surface cycle is diminishing rapidly 2 or 3 years. The major elements to keep up the competitive edge are technology, it's continual up gradation, technology forecasting and assessment and the resulting vision of the future which helps preparing the firm or the organization deal with its continuously renewing and fast changing cycle. Only when such a holistic view is shared by many stakeholders in the chain, then it is possible to have a proper uninterrupted knowledge flow in the chain and ensure the supply of specific products and services. This is the essence of technology transfer which needs to be grasped and joint actions are to be taken.

The adoption of a science and technology policy had evolved setting up of a chain of R&D laboratories of national importance in India. The major scientific agencies in the country include

- Defence Research Development Organisation (DRDO) with over 50 laboratories
- Department of Space (DOS) with around 8 laboratories
- Indian Council of Agricultural Research (ICAR) with over 70 laboratories
- Department of Atomic Energy (DAE) with around 15 laboratories
- Department of Scientific and Industrial Research including Council of Scientific and Industrial Research (CSIR) with 39 laboratories
- Ministry of Environment and Forests
- Department of Science and Technology (DST) with around 20 scientific institutions
- Department of Biotechnology (DBT) with around 6 laboratories
- Indian Council of Medical Research (ICMR) with over 25 laboratories
- Department of Ocean Development (DOD)
- Department of Information Technology and
- Ministry of Non-Conventional Energy Sources (MNES).

In addition to the R&D laboratories and establishments, there exists a vast network of universities, technical institutions and colleges in the country. There are around 250 universities/deemed universities, including 11 institutions of national importance and over 12,000 colleges. The annual out-turn of S&T personnel is over 250,000. Doctorate degrees awarded annually are around 11,000 more than 50% of which are in the areas of science, engineering, technology, medicine and agriculture. The estimated

stock of S&T manpower in the country is over 7.5 million. India has 7.8 scientists, engineers and technicians per 1000 population.

The Department of Scientific and Industrial Research operates a scheme wherein recognition to in-house R&D units of industry and non-commercial scientific and industrial Research Organisation is provided. There are over 1200 recognized in-house R&D units in all sectors of industry and over 550 recognized scientific and Industrial Research Organizations (SIROs) as on March, 2006.

These are also various R&D and innovation centers which continuously provide expertise, technically qualified and trained manpower and technology support to design and development of innovative products and innovations.

Presently there are more than 0.3 Million R&D personnel employed in the R&D sector of industry. DSIR also administers the fiscal incentives, announced by the government from time to time to encourage R&D by industry.

The Indian Innovation System is presently going through a nascent stage, continuously adapting itself to the newer ways of conducting R&D and commercialization. The Government funding schemes and the incentives to R&D are considered essential to commercialize the results of innovations. In this era of globalization, Indian Innovation System would be keen to participate in a global innovation system, wherein an *idea is generated in one part of the world*, *prototype is developed in another* and it *is commercialized in yet another part of the world for global consumption.*

Industry – both the public and private, R&D Institutions and Universities are becoming more closely involved and aware of the importance of cooperation in the area of S&T and technology transfer to promote sustainable industrial, economic and social development. The emergence of a free market, formation of international trading blocs, development of new technologies with low half-life periods, the incoming of an information age, and the necessity of improving quality to meet the requirements of international markets have strongly affected business and is forcing industry to look support from academia and the R&D Institutions.

There is an increased thrust on public-private partnership models to nurture and support the entire innovation chain in the country. Government is continuously enhancing the S&T outlays over the five year plan period and is allocating higher funds for supporting cutting-edge R&D and innovative projects. Apart from various funding schemes available in the country, new schemes such as Technopreneur Promotion Programme, Pharmaceuticals Research and Development Support Fund (PRDSF) and Small Business Research Industry (SIBRI) are continuously being launched. NGOs in tandem with government are turning enthusiastic to trigger an innovation movement in the country so as to enhance the share of innovative products in country's production and exports and thereby help the country to attain a competitive ranking in the national and international market. Foreign venture capital institutions and angel investors are also showing keen interest to support the innovation activity in the country. India is a global platform for R&D has already been demonstrated by the presence of more than hundred R&D centers of MNCs in India. India, now aspires to establish itself as a manufacturing base for hi-tech products and services. The growth of Indian Innovation System in the coming years is expected to play a crucial role in realization of dream to take lead in the development of emerging technologies.

This paper attempts to study a few Indian experiences of the ***Industry -- R&D Institutions – University collaborations*** and ***how such mechanisms have facilitated effective Technology Transfer in India as well as in some other countries, with emphasis on the Asia Pacific countries.*** The various linking mechanisms, the government-supported programmes for stimulating and funding such alliances, modalities of structural and organizations arrangements and so on, will also be examined. The precursors and accompaniments to make the technology transfer more effective would be highlighted.

The dynamics of managing technology in a growing economy like India is an important factor and need to be addressed. Also, how the processes work most effectively along with strategies to increase the scope and impacts of technology transfer will be examined. Few case studies would be covered to emphasize the importance of the *Triple Helix cooperation.* Based on the above, suitable recommendations will be made for framing suitable policies for promoting the triple helix cooperation.