

Technology development: Innovate, patent or perish

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There is a need for identifying, developing and upgrading Indian technologies which should excel globally. In the liberalization regime, it is the development of indigenous technology which would avoid the repetitive import of technology in frontier areas, not the multi-national companies.

TECHNOLOGY has been regarded as a determinant factor to the economic development. It is the level of technology which demarcates between the developed and the developing nations. And, recently the introduction of new technologies is restructuring the global pattern of production and trade in a significant manner. This induces policy for Intellectual Property Rights which aim to protect the monopolistic power of technological development as well as promote technological growth in a new environment of liberalization.

There is a universal realization that unless concerted efforts are made to build local technological capacities for absorbing the strength of the recent available market technologies, any attempt to develop indigenous technologies will encounter enormous difficulties. Thus, whether it is the indigenous development of technology or its acquisition from abroad, R&D constitutes an important component of the innovation chain for promoting technological development in the country. R&D enables the industry in creating a technology base in the country towards:

- providing quality goods of international standards,
- adapting and adopting the foreign technology,
- strengthening the capacity & capabilities of S&T infrastructure, and
- equipping the S&T manpower to face the challenges that lie ahead.

Industrial research is expected to commercialize the available scientific knowledge and technology for the national welfare – covering financial and social responsibility. The development of indigenous technology would, thus, improve the production of natural resources and increase the industrial output. The technological innovation would avoid the repetitive import of technology and the high cost involved thereby for producing quality product(s) needed for the national and international markets.

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Scene in India

'Indian science and technology must unlock the creative potential of our people and help in building the India of our dreams' – so says the Technology Policy Statement of India, enunciated in 1983. As a chief patron, the Government of India promoted the development of S&T in the country. With the provision of liberal financial support and policy measures, S&T infrastructure has been created, capable of tackling R&D problems with the so-called (third) largest manpower, i.e. capacities and capabilities have been built in many fields (Table 1: Indicators of R&D). But, recently, it has been observed that there have been several unhealthy trends because of which S&T has not contributed to the industrial growth. For example:

- Scientific and technological research started in India with a leaning on academics and the structure and

Table 1. R&D scene in India (1994–95)

GNP devoted to R&D	0.81%
Percentage of sales turn-over spent on R&D by industry	0.60%
Personnel employed in R&D establishments	3.14 lakhs
Women in R&D activities	10,505
Performing R&D activities	36.4%
Performing auxiliary activities	31.4%
Performing administrative activities and non-technical support	32.2%
R&D expenditure incurred by the Central Government	76.9%
Industrial expenditure on R&D as sales turn over	0.60%
Per capita R&D expenditure (in US \$)	2.39
Patents sealed in India and patents sealed by Indians	1746 442
No. of research papers published	16,949
Products developed	5307
Processes developed	2885
Import substitutes developed	3043
Design prototypes developed	2442
Consultancy services rendered	12,990
India's contribution to world publications	2%

linkages necessary to carry the fruits of R&D into the market place has not been adequately built up.

- There is a lack of long-range corporate plan for R&D projects.
- The output of most industrial R&D programmes is not satisfactory, both in quality and quantity, and is not currently adequate to meet the challenges of today, let alone those of the coming decades.

New initiatives

The research in science and development in technology (R&D) activities should be closely linked to the promotion and strengthening of national industry. The current scenarios demand that S&T cannot be carried out the way these have been pursued during the past 50 years. The relationship between S&T and industry has assumed a new role for techno-economic progress. Realizing the importance of R&D towards technology development in the country, recently several new initiatives have been introduced such as:

(1) *Legal measures*: Technology Policy Statement, 1983; R&D Cess Act, 1986; Technology Development Act, 1995.

(2) *Tax incentives for R&D*: Full deduction under income tax relief, vide section 35(I)(i); 125% weighted tax deduction, under section 35 (2AA); Custom duty exemption; 5-year tax holiday, under section 80-1A; Excise duty waiver, under section 35 (2AA); Accelerated depreciation allowance, under section 35(2); Price control exemption.

(3) *Honours and awards*: DSIR awards for excellence in R&D; Shri Ram Memorial and G.M. Modi Awards, Birla Foundation, Hari Om Awards, Madhya Pradesh State Govt, etc.

(4) New institutions for technology assessment, forecasting and financing.

TIFAC (Technology Information, Forecasting and Assessment Council, New Delhi) has generated Vision 2020 documents in 20 areas, besides producing technology assessment and technology forecasting and techno-market survey reports in many sectors of the Indian economy. The strength of Indian technologies identified in these reports should be exploited with the aid of financial assistance provided by Technology Development Board and other government-aided as well as other financial institutions.

R&D in industry can only contribute in meeting the technological challenges ahead. Perhaps new measures and instruments evolved would make this contribution

sizable and timely to enable India to become a profitable partner in the era of liberalization, privatization and globalization.

There is need to integrate capabilities of Indian scientists and technologists, built over the past 50 years, with business of doing work in industry. The collaborations on R&D between academic, R&D and industrial sectors should range from evolving contract research to setting up joint ventures, forging thereby, strong linkages between the analytical capabilities of R&D institutions with production capacities of the industry. Since the industry is fully aware of the latest technology/technological products available abroad, it would like to fund projects only in those new and emerging fields so that the industry has not to go for its further imports. Thus, R&D should become innovative and not adaptative or imitative in nature, leading thereby towards the generation of a technology base in the country, i.e. development of know-why culture while importing know-how from abroad, keeping in view the know-where approach.

In order to strengthen the country's S&T base, a two-pronged strategy has to be pursued, viz. (i) to enhance domestic technological capabilities in the strategic sector of the economy; and (ii) to initiate R&D efforts in frontier areas of S&T to enable the country to play a significant role in the emerging world technology market.

Conclusion

The application of S&T for industrial growth is an inter-related phenomenon to which the socio-economic milieu provides a ground for enhanced productivity and growth in economy. This would entail change in the mindset, i.e. from attaining of self-reliance to targeting beyond self-reliance so as to excel in the global market and from the publish or perish regime to the new era of innovate, patent and flourish or perish. It is the dynamism of R&D that would decisively determine competitiveness in the global market and consequently the future of economic growth. Given the very substantial capacities and capabilities that the S&T system has now acquired in India, the next decade should be a fruitful one for the application of S&T towards making India a strong nation in the world.

Internationally, there is intense pressure to manage S&T more effectively due to increasingly turbulent markets, heavy competition and government cutbacks. Let us lay stress on the development of technologies, in new and emerging fields, towards achieving commercialization and excellence in India and abroad.