NRDC: The story of the transformation of a public enterprise

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The National Research Development Corporation (NRDC) is a unique organization and the only public sector enterprise dedicated to the licensing of industries and commercialization of indigenous technology. It was set up in 1953 as a company enabling it to retain its profits without having to declare dividends. Similar organizations elsewhere largely deal with taking out patents on inventions generated in universities and public funded R&D laboratories and licensing them to industry, or acquiring technologies on a highly selective basis for further development and licensing. However, NRDC has much wider charter. The basic intent is to ensure that worthwhile inventions from universities, government laboratories, small/medium firms or individual inventors do not go unrecognized and that, where possible, they are commercialized.

Between 1955 and 1970, the Corporation was earning a meagre premium of around Rs 1–3 lakhs per annum, and the royalty earnings were around Rs 7–10 lakhs per annum. During the next fifteen years, the Corporation's premium earnings increased to around Rs 20 lakhs per annum and the royalty earnings increased to Rs. 86 lakhs.

In the mid-1986 a major review of all aspects of the Corporation's objectives and activities was undertaken and these objectives were rationalized and made explicit (see Annexure 1). A new strategy was accordingly drawn up composed of many important elements (see box 1).

A brief account of the nature of the activities undertaken is given in the following paragraphs.

Weeding out obsolete technologies

This exercise included weeding out technologies which were not viable for licensing commercialization. As a result, the total number of processes in the Corporation's licensing portfolio was reduced from 1955 to 800 as of March 1992.

Interaction with CSIR laboratories

Although CSIR is the major source from which NRDC licences its technologies, the early eighties saw a decline in interaction with CSIR laboratories. To correct this trend and reestablish close working relations, several initiatives were taken. These included: visits to various laboratories to familiarize with the present and projected activities of each laboratory and to convey to the laboratories the various elements of the new strategy of the Corporation to increase the utility of NRDC to CSIR laboratories; NRDC officials visited the laboratories to understand the R&D projects underway, technologies ready for licensing and those ready for licensing in the next 1–2 years; the Process Release Committees (PRC) were constituted to consider processes/technologies ready for licensing to industry and fix broad terms such as lumpsum premium and royalty on which each of them should be licensed; through its membership of the Technical Evaluation Committee and the Foreign Investment Board, the two bodies which consider applications for foreign collaboration/technology import, the Corporation alerted the concerned laboratory about the potential import of technology and whether a credible process/technology could be offered to the entrepreneur from CSIR through the Corporation. Thus, the Corporation established a good working relationship with CSIR laboratories.

Acquiring technologies from other R&D organizations

The Corporation had concluded 'Master Agreement' with ICMR and ICAR in 1984 and 1985 respectively. To achieve better interaction, a strategy similar to that described for CSIR was implemented. As a result, three major technologies from the Vector Control Research

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Box 1. Features of the new strategy

- ★ Weeding out obsolete and widely available technologies from the Corporation's portfolio
- ★ Increasing interactions with CSIR laboratories for more effective technology transfer
- ★ Acquiring technologies for licensing from other R&D organizations such as ICAR, ICMR and DRDO as also from ITTs and independent R&D institutions
- ★ Acquiring technologies from industrial companies for licensing and commercialization
- ★ Increasing interaction with licencee companies
- ★ Patenting important processes assigned to the Corporation
- ★ Agressive marketing of the Corporation's technologies to the industry
- ★ Getting professional market surveys done on products for which the Corporation had the know-how
- ★ Undertaking techno-commercial evaluation and optimization of major technologies
- ★ Preparing comprehensive know-how documents on major technologies
- ★ Preparing professional feasibility and project reports on major technologies
- ★ Priority promotion of key technologies through development loans to and/or equity participation in the companies of first licencees
- ★ Arranging financing from venture capital companies for the Corporation's licencees
- ★ 'Across-the-counter' sale of simpler technologies
- ★ Mounting a major drive on export of projects involving indigenous technologies
- ★ Undertaking a major programme of training and HRD of the Corporation's staff
- ★ Extensive computerization of the Corporation's activities

Centre (VCRC) of ICMR were identified, Cyclosporin-A, an immuno-suppressive drug which is a critical requirement in kidney and other organ transplantation; Thrombinase, a completely new molecule with excellent action as a blood clot remover; and *Bacillus sphericus* biopesticide specially suited for controlling mosquitos. The process know-how on these products was assigned by ICMR and the Corporation in turn has already licensed Cyclosporin-A to M/s Cadila Laboratories, Ahmedabad. The Corporation also took action to patent all the three drugs not only in India but also in North America and Western Europe at its own cost. Enquiries for licensing Cyclosporin-A have also been received from a company in USA.

Continuing its search for indigenous know-how with commercial potential, the Corporation identified medical products developed by the Institute of Research in Reproduction, Bombay, and the National Institute of Virology, Pune, and has acquired technologies for licensing.

In the case of ICAR, processes from the Central Institute for Research on Cotton Technology (CIRCT), Bombay, and the National Dairy Research Institute, Karnal, were assigned for commercialization. The Corporation also decided to fund large-scale trials on the process for preparation of a semimechanical pulp to make paper from cotton stalk developed at CIRCT.

The interaction between the Corporation and Defence R&D Organization had been underway since 1956. However, during the seventies and the eighties DRDO laboratories had developed several technologies capable of being commercially exploited to meet the needs of the civilian market as well. A Memorandum of Understanding between the Corporation and DRDO was signed in 1989 under which the Corporation can commercialize inventions and processes developed by DRDO.

The Corporation concluded Master Agreements with the Indian Institute of Technology at Bombay, Madras, Kharagpur and New Delhi and as a result the Corporation commercialized the processes for the manufacture of precipitated silica from rice musk and spirally groved grinding wheel developed at IIT, Kharagpur and Madras respectively. Five processes have been assigned by IIT, Delhi, for commercialization.

During the first four months of 1992–93, the Corporation entered into agreements with the Bhabha Atomic Research Centre, Bombay; the Central Power Research Institute, Bangalore, and the Electronics R&D Centre of the Department of Electronics in Trivandrum. These have led to the assignment of several commercially valuable technologies to the Corporation for licensing.

Technologies from industrial companies

Traditionally, NRDC confined itself to know-how and processes developed in government-funded R&D laboratories. However, it became increasingly clear that R&D laboratories of industrial companies were also potential sources of new processes/technologies for licensing and commercialization. The Corporation therefore set out to identify new opportunities and was able to reach agreements with companies in both public and private sectors. An MOU was signed with BHEL in 1990 whereby technologies developed at BHEL would be assigned to the Corporation for licensing. Similar agreements were entered into with the Haryana Electronics Development Corporation, the Hindustan Aeronautics Limited, and the DCM Chemical Works. The technologies developed by these organizations have been assigned to the Corporation. The Corporation is thus engaged in identifying suitable clients for integrated process-cum-engineering-cum plant and equipment packages based on this knowhow.

Interaction with licensee companies

By 1987–88, the Corporation had around 330 licensees paying royalties under licence agreements in force while another 680 who were similarly obligated were not paying royalties. Several complaints from licensees about problems with the know-how they had been licensed were attended to and rectified. The site visits to about 500 licensees resulted in the Corporation being able to build up a comprehensive database on almost all its licensees and to bring a number of royalty-defaulting licensees into its fold.

Patenting of important processes

Most of the processes/technologies assigned to the Corporation had not been patented when assigned by the R&D organization. However, as the new strategy unfolded it became increasingly clear that all major processes need to be patented at home and abroad to protect the technology and enhance the commercial value of the technology to industry. Over the last four years Indian patents for: spirulina alga protein concentrate, cyclosporin-A, thrombinase, artificial heart valve, blood bags and negative photoresist—a chemical used in the manufacture of semiconductor devices— have been filed or taken out in other countries such as USA, UK, Germany, France, Switzerland, Japan, Canada and Australia.

Aggressive marketing

The Corporation has been using a multi-pronged strategy towards aggressive marketing of its technologies to industry by informing the industry of what NRDC can offer through such media as newspapers, television, exhibitions, seminars and hoardings. These mechanisms of stimulating the interest of entrepreneurs in NRDC technologies were complimented by (a) documentation on the Corporation's portfolio of technologies, (b) discussions with entrepreneurs who visit the offices of the Corporation, (c) response to written queries from entrepreneurs, (d) arranging visits to R&D laboratories so that entrepreneurs can hold discussions with the concerned researchers, (e) providing information to the entrepreneur on the size and growth potential of the market, (f) preparing project report for licensees on important technologies and (g) arranging complimentary finances through VCF, RCTC, TDICI, etc.

Professional market surveys

Detailed information on the character, scale and future evolution of the market for the product to be made is a key element of any industrial venture. The Corporation was successful in identifying product areas from its technology portfolio requiring such market surveys and commissioning agencies to undertake such surveys on those products. Over the last five years detailed market survey documents have been generated by the Corporation (see box 2). These surveys were more important than market assessment documents; they also covered the identification of prospective licensees for the technology(ies) involved and some indication of the financial terms of licensing that the marketing could bear.

Techno-commercial evaluation

Experience has shown that, at least in the case of major technologies, the process as developed by the laboratory concerned should have been techno-commercially evaluated and optimized by NRDC prior to licensing to industry. An important element of the new strategy involved this activity using inhouse expertise and/or external consultants/experts.

Know-how documents on major technologies

A major criticism by industry of know-how from R&D laboratories was that the technical documentation provided on the know-how was most often highly sketchy and incomplete. To overcome this problem, the Corporation mounted on a major effort to generate, jointly with the laboratory concerned, comprehensive technical documentation on the know-how offered.

Box 2. Market survey generated by NRDC

★ Futuristic pesticides
★ Anti-corrosion paints
★ Metal powders
★ Ceramic colours, glass tints and coloured and coated glasses
★ Biomedical electronic equipment instruments
★ Industrial burner with special reference to acoustic liquid fuel burner
★ Collegen sheet
★ Spirulina algae
★ Automative components
★ Precipitated and activated calcium carbonate
★ Aluminium hydroxide gel
★ Magnesium metal
★ Jojoba body cream

Feasibility and project reports on major technologies

An important finding of the review of the Corporation's past operations and its interaction with the industry was that, at least for major technologies, licensees were more inclined to take on indigenous technologies if the market survey reports, technocommercially optimized know-how and comprehensive know-how documentation were combined with project-specific feasibility/project reports. The Corporation thus accorded priority to the preparation of such reports with focus on documents containing the necessary technical and commercial information. Some of the major feasibility project reports prepared by NRDC are given in box 3.

Box 3. NRDC feasibility/project reports

★ High-purity gallium metal
★ Chromium metal
★ Phosphor for black and white TV picture tubes
★ Thick film hybrid microcircuits
★ Spirulina alga
★ Rice husk boards
★ Fly ash bricks
★ Precipitated silica from rice husk
★ Hydrazine hydrate
★ Sodium azide
★ Low density precipitated silica

Promotion of key technologies

As seen earlier, providing finance for upscaling laboratory know-how to pilot/demonstration/semi-commercial/first commercial plants, has been an important aspect of the Corporation's charter. However, the general tendency was to take on a large number of small projects without prior assessment. The new approach followed has been to provide more substantial levels of funding for a smaller number of more significant projects after careful assessment of the market. Almost all the projects thus promoted have either successfully gone into commercial production or are in the process of doing so. A distinctive feature of the technology development financing which the Corporation has been providing in such projects is that loans have been interest-free.

Arranging financing from venture capital companies for the Corporation's licensees

The period 1986–88 saw the emergence of venture capital financing by three central, industrial, finance companies. The Corporation was quick to recognize the strong relationship that can be established with these new entities. Action by DSIR led to the establishment of close interlocking arrangements between NRDC and these venture capital funds, particularly the VCF of IDBI.

'Across-the-counter' sale of simpler technologies

The Corporation continued to support its important

client community in the small-scale sector also. A significant initiative taken in this regard was to licence simpler technologies to small-scale industries through agreements which involve the payments of only a lumpsum premia in one instalment without any royalty.

Export of projects involving indigenous technologies

The Corporation had been exporting technologies in various forms to other countries since 1966 on a very low key. In 1982 when the Corporation started getting grants from the Ministry of Science and Technology the export of technology activity started in an organized way. Nepal, Indonesia, Kenya, Thailand, Madagascar, Guinea, Ethiopia, Senegal, Brazil, Egypt, etc. were a few countries to which the technology was exported.

Training and HRD of staff

The Corporation started functioning with a meagre staff. In 1986, the Corporation was restructured and a number of professionals were induced who were then deputed to various courses for training.

Computerization

A Multi-User Data Processing Centre became operational in 1989 and several key areas of operations were modified to make them computer-based. Concurrently, application software packages specific to the operations of the Corporation were developed in-house and put into regular use for these areas.

The systematic and sustained pursuit of all elements of the new strategy outlined above has led to a total transformation of the operation of NRDC over the last five years.

Assignment of technologies to the Corporation for licensing

Figure 1 indicates the steep improvement on this life blood of the Corporation's operations. Despite even CSIR laboratories being free to license their processes directly to industry since 1987–88, the Corporation has been able to continue to acquire processes from CSIR laboratories over the last four years. What is more, there has been a steep increase in the in-flow of technologies from other R&D organizations and industrial companies over this period.

Earnings by way of lumpsum premia from new licence agreements

The position here is indicated in Figure 2. It will be

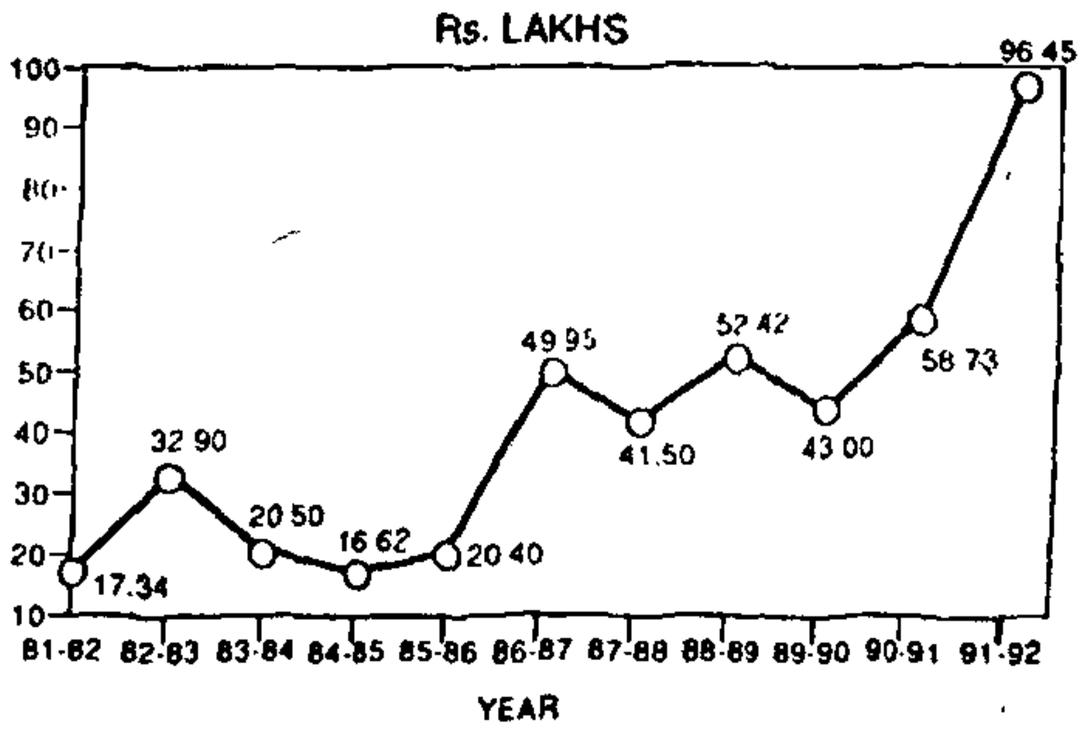

Figure 2. Gross premia earned from industry.

seen that the turn around the declining revenues has been swift and the subsequent growth steep.

Earnings by way of royalties

Figure 3 indicates how the downturn witnessed in this regard from 1983–84 to 1987–88 consequent on the

Figure 1. Number of processes assigned by R&D system.

Figure 3. Gross royalty earned from industry

Table 1. Financial performance during 1985–86 to 1991–92

(in Rs. lakhs)

	85-86	86-87	87-88	88-89	89-90	90-91	91-92
Premia	20.40	49.95	40 00	52.20	43.00	55.93	96 00
Royalty	67.73	49.99	38 08	45.67	66.76	65.44	93 85
Consultancy fees including feasibility, project reports	2.40	3.52	4.14	1.62	11.07	14.05	11.16
FE receipts from exports	1.58	1.92	3.87	7.16	34.09	98.72	127.92
Other income	39 83	39.89	59.65	59.72	35.32	66 13	85.59
Total income	131.94	145.27	145.74	166.43	190.24	303.27	298.24
Gross profit	(+)2.52	(+)6.51	(+)22.83	(+)25.10	(+)21.71	(+)63.67	(+)68.43

completion of the term of the licence agreements for some 5–6 major technologies entered into in the seventies has not only been arrested but has been totally reversed. This has been due to several factors: (a) the Corporation being able to realize blocked royalties by arriving at compromise settlements with some major licencee companies; (b) more effective collection of royalties from ongoing licence agreements entered into in the late seventies and early eighties and (c) quicker realization of royalties from companies licenced technologies in the 1985–86 to 1987–88 period.

Overall financial performance

Table 1 shows the overall financial performance of the Corporation over this period. It will be seen that there has been a steep improvement in profits form Rs 2.5 lakhs in 1985–86 to Rs 62 lakhs in 1991–92.

Annexure 1

Objectives of NRDC

Commercial

(i) *Commercialization of laboratory know-how*

★ Licence indigenous technologies to industry
★ Provide technology development loans for setting up pilot plants to prove/scale-up laboratory processes
★ Participate in equity to facilitate formation of new ventures using indigenous technologies
★ Technology development programme for priority projects
★ Design and engineering programme for upscaling laboratory processes
★ Techno-commercial financial support to entrepreneurs commercializing NRDC technologies

(ii) *To become an international technology transfer organization*

★ Licensing of indigenous know-how to clients worldwide
★ Execute turnkey projects abroad based on indigenous technologies
★ Licensing of indigenous know-how worldwide

Promotional

(i) *Promotion and commercialization of inventions*

★ Award meritorious inventions
★ Provide financial suport to prospective inventors
★ Assist inventors in commercialization and patenting

(ii) *Development and promotion of rural technology*

★ Identify, prove and demonstrate selected rural technologies
★ Assist in commercialization of selected rural technologies

(iii) *Export of technology*

★ Project India as a source of technology

(iv) *Dissemination of information of technology transfer*

★ Provide information on indigenous technologies
★ Organize training programmes for technology development and transfer
★ Hold exhibitions, publish periodicals, arrange audio-visuals to popularize indigenous technologies