Silk purse for sows' ears?

Managing Director **W. Makinson** exposes the workings, triumphs, and failures of the UK National Research Development Corporation (NRDC)

DESPITE the occasional protestation to the contrary the university inventor is accorded an important and respected status among the NRDC's clients. Without his contributions it is doubtful whether Sir Stafford Cripps' concept of a statutory body for promoting technical innovation would have survived the political events of the late 1960s and early 1970s. During the corporation's life, however, the attitudes of central government and the universities to research and its industrial application have changed markedly. The declining status of Britain in international trade, and, in particular, the failure of its manufacturing industry to compete with those in other developed countries has underlined the need to promote and utilise university research. The creation of wealth is arguably as important as the pursuit of knowledge, even at the expense of traditional academic freedoms. The NRDC's task, as defined in the 1948 Development of Inventions Act, is to assist in the transfer of new technology from the laboratory to industry, and because the corporation aims to be self-financing it has adopted arrangements that provide wherever possible for the recovery of the costs incurred.

It is hardly surprising, therefore, that the role of the NRDC in universities has come in for some critical examination. Those affected by new constraints, and those strongly motivated by the wish for closer and more productive relationships between academic and industrial communities, retain a deep interest in the directions followed by the organisation. This reappraisal has led to suggestions that technology emerging from universities might be better exploited by other routes than those offered by the NRDC itself.

There could be grounds for this new attitude. Some inventors are industrially oriented and have enough familiarity with legal, patent and commercial matters to go it alone. But they are rare. Experience shows that there are proven advantages in adopting a professional, centralised approach to exploitation, particularly where new technology is of international significance. Successful exploitation requires a careful blend of talents and resources: professional skills, a wide knowledge of industry, financial resources, an ability to assess and take risks and, on occasion, some ruthlessness in decision taking are all essential. This is often not appreciated by academic research workers, to whom the invention is the major event rather than the starting point of a process fraught with problems and pitfalls, many of which he is neither qualified nor equipped to meet alone.

Moreover, experience also indicates that the majority of inventions turn out to have little commercial potential, however professionally they may be handled. And, paradoxically, it is the almost quixotic willingness of the NRDC to devote time and money to university cases which probably do not justify support and consequently fail, that has led to criticism. This cannot be lightly brushed aside, however: the corporation needs to retain the confidence of the academic research community.

Patent protection

The NRDC plays a crucial role in both establishing and protecting industrial development that may arise out of basic research. The world of patents is now so complex and has so many ramifications that it cannot be effectively handled without the aid of the specialised professionals. Industry can, in some fields, get by without patent protection and can penetrate markets simply through dynamism, confidential know-how, and competitiveness. Where the element of innovation is high, however, companies usually insist on adequate patent protection for as long as possible after products become established. This is especially true in the case of, for example, pharmaceuticals.

The executive officers of the NRDC are well supported by commercial, legal and patent services on a scale which compares favourably with all but the largest multinational companies; its patent department, for instance, is among the largest in the United Kingdom. These expert advisory services are available to university inventors even if they are not already clients; the earlier an enquiry is made, however, the more useful any advice is likely to prove.

Once an inventor has placed himself in the hands of the NRDC he must accept certain limitations. He is less free to dictate the subsequent course of development and exploitation, while his share of any subsequent revenue is inevitably cut. This may conflict with a drive for recognition through immediate publication; it may also preclude direct personal arrangements with individual companies, even though that could be the most obvious route to early exploitation. Existing or future patent rights are assigned to the NRDC, and equity is maintained through a revenue-sharing agreement which divides proceeds from licence royalties or other income between the corporation and the university concerned (or the inventor). Under current arrangements, the rights to inventions arising from projects funded by UK research councils have, in most cases, to be assigned to the NRDC anyway.

The time that the NRDC takes to decide whether support is worthwhile has occasionally been a source of frustration. But some delay is inevitable. Potential markets must be properly assessed, as must the potential patent strength. Regrettably, the more commercially attractive propositions are more likely to run up against established competition. But throughout, the corporation maintains close contact with the inventor.

Finance for development

Unlike foreign government agencies with similar responsibilities, the NRDC can provide funds not only for research programmes which may eventually prove of commercial significance, but can also support the further development of inventions already made. Indeed, if the support for further development were not available it is likely that many university inventions could not be effectively exploited. Bearing in mind the NRDC's reserve borrowing powers and currently favourable financial status, there is, within reason, no upper limit to funds available for any particular project, as long as it can be effectively deployed. The slogan adopted by the corporation in 1973: "£1,000,000 available for university research", is no idle statement.

The corporation always seeks the most effective route to commercialisation, so it usually attempts to involve an appropriate industrial organisation from the outset, either as a potential licensee and/or as a joint source of development funds. Negotiations may be carried out either by the university or the company, or both. It is quite normal for an inventor to act as a consultant on mutually acceptable terms.

Failure to arouse industrial interest in a particular project might often indicate that attempts at exploitation should be abandoned. On the other hand, it could be simply that a lack of sufficient evidence (in the form of a working prototype, for example, or of credible test results) is the only reason why industry cannot be persuaded that

an innovation is of importance—this is the "predevelopment gap" referred to in the Richards Report to the Engineering Board of the UK Science Research Council. While such a gap can be bridged by NRDC funds, the corporation will not shell out extra support merely to keep inventors happy; nor will it support an unnecessary research team, however competent. When further work is carried out in a university at the NRDC's cost a portion of any royalties is usually set aside to offset these expenses.

NRDC contributions to company development costs are recovered separately through a levy on subsequent sales of products exploited. The levy is calculated to provide a return reasonably related to the risks involved. The terms have from time to time been criticised as harsh, particularly when applied to proposals submitted by embryo, campus-based companies set up to exploit the results of research projects undertaken in a particular university. The criticism should be viewed against the statistical record, however, which shows that in three out of four cases the NRDC fails to recover its investment.

The corporation does not provide grants for company support, nor does it undertake to provide general working capital, except where an identified invention is involved. Companies must in such cases seek other sources of finance and accept the terms and conditions normally associated with them. It is worth noting, however, that support by the NRDC does not inhibit companies from qualifying simultaneously for other types of government assistance, nor need NRDC funding rank as a contingent liability where bank overdrafts or term loans are concerned.

Track record

Since its inception the NRDC has received about 5,000 proposals from universities, and taken assignment in about 2,000 cases. This compares favourably with the overall national picture including all sources of support —34,000 proposals and 6,000 assignments. So far, of the 2,000 university inventions supported by the NRDC about 200 have emerged as revenue earners; over the past five years this is about one out of every five or six submissions. The cumulative income attributable to university research is about £15 million, of which about £8 million has been recouped by the NRDC revenue-sharing agreements.

At present, the NRDC is involved in about 90 development projects involving universities, representing a total investment of about £1.5 million, about £1 million of which is actually being spent with the inventors. The largest single current commitment is that with

Photo: Dunlop

The Dracone, a soft failure

the Southampton Institute of Sound and Vibration Research where £160,000 is devoted to research into techniques to produce light-weight quiet, diesel engines.

By far the most conspicuously profitable inventions so far have been those made 20 years ago by research workers in the Sir William Dunn School of Pathology at Oxford in collaboration with the Antibiotics Research Station of the Medical Research Council. The work involved led to the discovery of the drug Cephalosporin C and the subsequent isolation and identification of its nucleus; worldwide licensing arrangements currently provide approximately 80% of the corporation's total annual royalty income. Other significant 'winners' would include the anticoagulant Arvin (Penang and Oxford), portable heart/lung machines (Royal Postgraduate Medical School), peptides derived from bee venom (University College, London) and methods of extracting diosgenin (the starting material for steroids used in the contraceptive pill) from fenugreek (Nottingham). Perhaps the most notable engineering inventions were those of Manchester University relating to computers.

More recent developments for which high hopes are sustained include improvements in electrochemical cells (Newcastle), continuous countercurrent ion-exchange techniques for uranium extraction (Imperial College, London), pioneering work on high modulus polymers, and novel flotation columns for mineral processing (Leeds), ultrasonics applied to metal-working (Aston), "surround" sound systems (Reading), speckle pattern comparators (Loughborough), and Pole Amplitude Modulation synchronous motors (Bristol). The NRDC has also set up a wholly-owned subsidiary company for the further development and marketing of Genesys—a civil engineering computer-aided design system (CAD) initially developed at Lougborough University of Technology—and is in the process of creating a second software company for more generalised CAD packages. Though it is difficult to interpret statistics sensibly because of the often long gestation time of really successful inventions, the corporation is confident that the current input from university sources could maintain future royalties at a healthy level.

The NRDC has, of course, had its failures—sometimes spectacular—in its efforts to commercialise technically successful inventions. Any listing would have to include Dracones (large flexible floating containers for transporting fluids, based on proposals from Cambridge University) and the Tracked Hovercraft, which used the linear motor. Though the NRDC received no financial returns from either project both 'failed soft' in that the principles developed in these instances have been subsequently applied successfully to other industrial problems. Indeed, the Dracone, originally intended as an alternative to large oil tankers at the time of the Suez crisis, has been used to transport drinking water to the Greek islands, and might still play a useful role nearer home if the present drought persists.

Inevitably, many inventions from academic sources fail for simple technical reasons, usually in the translation from the original concept to practical realisation in commercial or industrial terms. Despite its years of experience, the corporation has no crystal ball; it will go on, no doubt producing more sows' ears than silk purses, but it has no intention of withholding support and encouragement wherever the rewards seem likely to justify effort and expense. □