Engineers New Zealand

IPENZ Informatory Note Eleven

Building Industrial R&D: The Missing Billion Dollars

March 2003

IPENZ ENGINEERS NEW ZEALAND:
The Institution of Professional Engineers New Zealand Incorporated (IPENZ) is the non-aligned professional body for engineering and technology professionals in New Zealand. It seeks to contribute to the community in matters of national interest. One part of its contribution is to issue informatory notes, which give a learned view on important issues, independently of any commercial interest. Such notes are not consensus papers of the Institution membership. Rather, they explore issues and describe possible outcomes and/or scenarios that could arise or develop. Others are free to quote or use material from this note.

ISSN 1176-0915

Introduction

The Minister of Research, Science and Technology, the Hon Pete Hodgson, challenged the audience at the 2002 strategy workshop of the Ministry of Research Science and Technology to "find the missing billion R&D dollars". He argued that New Zealand's public sector R&D spending, at about 0.6% of GDP, is about the norm for the OECD, but that our private-sector spending was very low – about 0.3%, or a quarter of the OECD average. The difference (about 0.9% of GDP) amounts to a billion that is not being spent on R&D in New Zealand industry. Government is committed to continuing support for basic research, which should represent about 20% of national R&D expenditure, and allocates about half its total R&D funding to basic research.

Developing public policy to use the remaining Government funding to lever a billion dollars of R&D spending out of our private sector is our most urgent R&D priority for economic growth. Steady increases in basic research spending can follow; but without an adequate structure to develop and support industrial R&D the potential benefits of basic research will not be fully realised.

The problem is not a new one. David Bibby of Industrial Research Ltd presented compelling evidence to the Royal Society of New Zealand conference in Dunedin in November 2000. When the R&D expenditure of multinational companies as a percentage of sales was compared with that of companies in New Zealand in comparable industries, the data showed that our expenditure was lowish, but not vastly different from global trends. The problem is that the kinds of industry we have in New Zealand are commodity-based and have low R&D spending internationally (often less than 1%).

The new post-industrial industries, typified by the electronics and software cluster operating in Christchurch, typically spend more than 10% globally and also in New Zealand. Biotechnology is an even higher spender; but the food industry is a low spender, casting doubt on the widespread belief that added-value food product represents the way to national prosperity. Bibby concluded that the current low expenditure reflects our industrial make-up; but this does not commit us to this pattern in perpetuity. Other countries have made radical changes.

It is now two years since Bibby presented these data, and not a lot has changed. The Foundation of Research, Science and Technology continues to tweak its systems in search of improvement. The legislative regime under which the Foundation operates was based on an ideology for Government spending in R&D that has become rather dated. The annual reports of CRIs talk about growing their business by lifting non-Government funding, but too often they are looking overseas for their new work, rather than growing the New Zealand industry, which they say is too hard. In some areas skilled researchers have been laid off.

We recognise that a Growth and Innovation Advisory Board has been established, and that taskforces in ICT, biotechnology and creative industries have worked hard on plans to grow these industries. The taskforces have been established in the key high-value areas for a post-industrial society – health, safety and well-being, fashion and entertainment – as IPENZ recommended in Informatory Note Three (May 2001).

However, too many of the recommendations in the Growth and Innovation Framework are difficult to gain traction from in the hard world of financing real industrial development. There is no real evidence that the recommended types of activity will lever the missing billion R&D dollars from industry on a realistic timescale. This country still has a fundamental structural problem, which we can no longer afford to disregard. A small number of simple and direct Government interventions to which the private sector can respond are urgently required.

Who are Government's levering agents?

The Government will find it very difficult to persuade industry to spend the billion R&D dollars without introducing compulsion or incentives. The holders of industry purse strings are unlikely to respond on a sufficient scale to anything other than financial incentives, so the question for Government is how to create the right incentives. The obvious agents are Treasury (through taxation changes) or the granting agencies such as the Foundation of Research, Science and Technology and the new conglomerate Industry New Zealand/Tradenz; but the rules under which they operate would need to be changed. There are also less obvious and potentially equally effective agents, such as the Crown Research Institutes and Universities. Changing the rules for these organisations so that their success depended on levering some of the missing R&D dollars out of industry might be very effective. Blunt instruments such as these must be contemplated.

Taxation policies

Allowing R&D expenditure to be written off at a higher rate than the recently approved 100% seems to be off the political agenda. Company tax remains an issue. Treasury is undoubtedly concerned about the potential loss of income if the company tax rate is dropped, but experiences in Ireland, for example, show this does not necessarily happen. When company tax is dropped so are the imputation credits, so more personal tax is paid on profits distributed to shareholders (note that in NZ well-remunerated shareholders will be paying 39% on their top dollar). Also low company tax rates are an incentive for multinationals to locate highly paid staff, working in areas such as corporate services and R&D in NZ, and such workers pay proportionately high personal income tax, usually more than the cost of the services they draw from Government.

Furthermore, companies find it much easier to invest in R&D when they are profitable. In times of financial difficulty the R&D budget is one of the first cut. We will not get major companies to bring, or

bring back, their R&D dollars to NZ while our company tax rate is high by regional and international standards.

Changing the behaviour of CRIs, universities and grant agencies

Through the last decade, Government research funding has been largely regulated according to the technology-push model, in which the research agency does fundamental work and then pushes the results out to industrial clients. There is a view in industry that the research sector is now too money-hungry for a return on its intellectual property, and perhaps unrealistic about its commercial value and the sharing of the risk in development – a sure sign that technology-push is faltering in practice.

The Marsden and NERF funds for fundamental research are intended to operate as technology-push instruments, but the Research for Industry (RFI) Fund should not. Privately-funded research generally follows the alternative market-pull model, in which rather more pragmatic R&D (with a greater emphasis on D) is undertaken to meet real market opportunities. Government-funded research has also been tied to historical patterns favouring cost-reduction or variants on existing primary products, so that our historical export earners can survive despite steadily decreasing international commodity prices. Only very recently has the Foundation started to change this pattern for the RFI Fund.

The net result has been very unsatisfactory – in their first ten years the CRIs, despite their best efforts, have not been able to lift private-sector R&D spending in New Zealand significantly. Worse, there has been far too little movement of funds to the sunrise areas, partly because this would have major impact on employment patterns in research. We still have too many production biologists and too few advanced software innovators in our research workforce.

It is time to admit that the $200m or so that government spends annually on research for industrial development is not going to lever that billion R&D dollars from industry unless the spending mechanisms are fundamentally changed.

Two key changes are needed. The first is to change the behaviour of those who currently receive the money meant for industrial development, by ensuring that they cannot get Government funding without also securing industrial co-funding. This should encourage them away from technology-push thinking and toward strategic partnership behaviour.

The second is to remove the present caps on Government R&D expenditure to guarantee rewards for those bringing industrial funding to the table. We operate an uncapped social welfare system that responds to demand (for example, every unemployed person is guaranteed a benefit) yet we insist on capping the very activity that offers the best chance of creating new highly-paid jobs. The Government's research budget is normally committed well in advance, while industry commits its funds at much shorter notice; so co-funding to support industry commitment cannot be guaranteed unless the cap is lifted. The risk posed by uncapping is very small relative to the totality of the Government budget.

If Government funding for research institutions that develop strategic partnerships with companies or industrial consortia were guaranteed and uncapped, there would be real incentives for Universities and CRIs to adopt the behaviours we sorely need. We must strip out inflexible requirements from Government funding arrangements, such as those restricting support to national or regional groups of companies so as to limit private advantage and appropriability. Asking companies who compete in the marketplace to co-operate on research (other than research to maintain market access) is to guarantee that they will do so only on projects that are not mission-critical, with consequently low rates of financial commitment.

The processes for securing support must be simple with low compliance costs – we are a nation of SMEs and they need to be able to engage with the research sector cheaply but effectively.

Rather than judging CRI performance solely against the prescriptive stewardship requirements of the CRI Act, we must provide incentives for CRIs to support and develop economic activity. Sadly, CRIs and Universities still find it more rewarding to grapple with the Foundation than to engage with industry and collaborate to seek support from the currently small co-funding pools.

Co-funding of the type suggested here is a form of tax relief – in effect, reverse taxation. The crucial variable is the co-funding ratio, which should be flexible to ensure that it is effective in different circumstances. For R&D in mature industries, the formula might require several private sector dollars to attract a Government dollar; whereas in sunrise industries a single private dollar might lever several Government dollars. Variable-ratio co-funding has not yet been applied in New Zealand. The proposal is not new – it was advocated by IPENZ in Informatory Note 3 (May 2001) – but progress towards such a mechanism has been very slow; only a small part of the RFI is used for co-funded work, and co-funding rates are not highly flexible .

The one-stop R&D shop

For a small country we have too many granting agencies working in areas related to R&D for economic development. There are enough impediments as it is, without a project having to start by seeking funding via the Royal Society of New Zealand (for example, from Marsden), move on to try for RFI funding (Foundation), then to either the Venture Capital fund via venture capital managers or Technology New Zealand (another part of the Foundation), and then to Industry NZ/Tradenz (which at least are combining). Industry and their research-provider partners needs a centralised and co-ordinated process. Varying the co-funding ratio

as a project moves towards commercialisation can avoid the need for hand-over between agencies, and create certainty for industries.

There would be some need to ensure appropriate separation of the granting systems for research for social or environmental imperatives from that for economic growth, while maintaining their complementarity; but this is unlikely to present a major problem.

The proposed model would reward those who secure the confidence of industrial partners simply and directly, under simple transparent rules. The present uneasy relationship between the major granting agencies and the CRIs and Universities over the distribution of industrial development funding would be resolved.

A change in the model would also encourage investment in R&D strategies rather than in projects. Such strategies could then provide a platform for a number of companies to develop separate projects and products. This model would also provide a basis for focussing the R&D spend, which is currently diffused across a wide range of projects.

Closing remarks

Finding the missing billion R&D dollars will not be achieved by doing more of the same better, as we seem to have been intent on during our progressive economic slide of the last ten years. It is about radical changes in the way Government funding is applied. It is about rewarding directly and reliably behaviours by which industries take responsibility for their own R&D. It is about radically re-thinking how to use the Government funds to raise private R&D expenditure. It is about making partnerships with industry the lifeblood of University and CRI research. It is also about a different approach to taxation, so that industrial investment makes good profits a resource pool from which R&D dollars can flow.

On 16 September 2002 the Minister stated that the Government wanted "do-able" programmes that did not involve radical reshapes of the system, and that tax reform was not on the table. Perhaps it is time to establish and do what is necessary – further small refinements are unlikely to be any more successful than those made during the last ten years.

Other Informatory Notes

Note One:	**The Role of Engineers in Developing National Wealth**
Note Two:	**Policy and Leadership Framework for Wealth Creation in New Zealand**
Note Three:	**The Role of Technology Education in New Zealand's Future Prosperity**
Note Four:	**Sustainability and Climate – An Engineering Response**
Note Five:	**Wealth Creation in New Zealand – Improving Intellectual Property Realisation**
Note Six:	**Climate Change and the Greenhouse Effect**
Note Seven:	**The Drive for Innovators and Entrepreneurs – School governance and technology education**
Note Eight:	**Managing Innovation**
Note Nine:	**Improving Resource Management**
Note Ten:	**Economic Growth and National Infrastructure**

For more information contact:

Engineers New Zealand

IPENZ National Office
PO Box 12-241
Wellington
New Zealand

Tel: + 64-4-473 9444
Fax: + 64-4-474 8933
email: ipenz@ipenz.org.nz
http://www.ipenz.org.nz