

Exploring New Zealand's R&D investment environment

MoRST and FRST clearly know how to help with innovation, but are struggling on a far from level playing field. By **Bob Gauldie** and **William Giesbers**

WE CLOSED OUR last article (March 2006) with the expectation that New Zealand would, based on overseas experience, have a two-pronged approach to profiting from innovation. One would be the high-stakes, long-odds, long-term investment in fundamental research at universities and government research laboratories necessary to produce the stream of high-quality graduates needed to implement new technology efficiently. The other would be some mechanism for company inhouse technology development to be used in short-term up-marketing of existing product lines.

How would we find out if the overseas experience is applicable to New Zealand? Firstly, let's look at the report 'Research and Development in New Zealand 2004', published in 2005 by the Ministry of Research Science and Technology (MoRST) and Statistics New Zealand. For 2004 the report showed \$1,593.2 million was spent on R&D in New Zealand: \$612.9 million by business, \$717.8 million by the government, \$113.5 million by universities, \$108.7 million came from overseas and \$40.2 million from

other funding sources. The report was based on a survey of about 2,200 enterprises and eight universities. The enterprises include both business and government organisations as categories, but 'business' is defined to include all State Owned Enterprises (SOEs) including Crown Research Institutes (CRIs). The report does not divide enterprises into the respective numbers of SOEs and commercial companies.

The report reveals no key for dividing up the categories 'business' and 'government' into a more realistic division that would reveal the exact respective amounts of private-sector and government spending, or even how many companies actually spent the \$612.9 million credited to New Zealand business. If we suppose, conservatively, there were 200 government organisations and 2,000 private companies in the business category, the implication is the companies each spent about \$306,000 on R&D.

Mixing SOEs with commercial enterprises makes the report difficult to untangle, but businesses are spending their own money on R&D. Thus, company inhouse technology development does occur. We do not, however, have any idea of how much value that company inhouse R&D generates, nor if the \$717.8 million spent on R&D by the New Zealand government, and the \$113.5 million spent by universities, also create profits for our businesses.

But the report offers some insights into our expected two-pronged approach. Next, we can look at the 'Outcome Evaluation of the New Economy Research Fund [NERF]', published by MoRST in 2005. Quoting the executive summary: "MoRST established the New Economy Research Fund in 1999 ... to spur economic growth by funding basic research that has the potential to lead the emergence of new industries. Since inception, MoRST has allocated \$299 million invested in 140 projects." NERF has spent \$60 million a year for five years to spur economic growth, so, what kind of return on this money should we expect? If the money had been spent on commercial property in Wellington over the last five years in tranches of \$60 million per year, we might expect the present capital value to be about \$600 million returning some \$60 million a year income. So what did NERF get for its money? The report does not mention anything about dollar return on investment, but does list that 0.4 commercialised patents and 0.02 licences were produced per million

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dollars spent by NERF. But how many of these patents earned money and how much, and, more importantly, how many of the patents were taken up by New Zealand companies and used to up-market their product lines? And how many patents were taken up by overseas companies and used to up-market their product lines that are sold here? The report doesn't answer these questions.

About 61% of NERF funding goes to CRIs, about 30% to universities and about 9% to commercial organisations, many of which are startups directly out of CRI and university research programmes funded by NERF. The NERF report does raise some interesting issues in relation to intellectual property, and a consistent theme of the report is the use of taxpayers' funds to conduct research in universities and CRIs to create publicly funded IP used by the universities and CRIs as if it was their own property. No company would fund research then allow its employees to treat the resulting IP as personal property, or use that IP to compete with the company whose money funded the research in the first place. This, however, appears to be the case for the New Zealand taxpayer.

The NERF investment does try to place itself in the area of long-term strategic investment doing long-odds research. Moving IP out of universities and CRIs into startups implies universities and CRIs are using their resources to compete in the New Zealand market in the area of inhouse, short-term product innovation. Just how much 30-year blockbuster fundamental research is funded by NERF is hard to evaluate. Looking through the NERF report it is difficult to detect any difference between the kinds of research done by universities and CRIs and the research done by the private sector. The majority of project titles imply that they are but one step away from a startup company.

There is not much evidence NERF funding is producing the graduates that are part of our long-odds research scenario. One idea

would be to meld the NERF funding granted to CRIs into a postgraduate research platform. CRIs are ideally suited to creating graduate schools, for upskilling researchers from the private sector, and for conventional postgraduates from universities.

The Foundation for Research Science and Technology (FRST) is one of the agents for MoRST in delivering and managing funding. The FRST 'Manufacturing Research Science and Technology Survey 2002/2003' brings us straight back to the key issue of funding the innovative up-marketing of company product lines. The FRST report also tells us how much NERF-funded research finds its way into New Zealand business. This is because its list of funded projects is, by title at least, more or less the same list of projects contained in the NERF report. Summarising the FRST report we find some support for our two-pronged approach based on overseas experience in the implementation of innovation in company product lines:

"The majority of the manufacturing companies have a commitment to R&D. Over 70% of companies invest in R&D from 2% to greater than 5% of annual turnover.

"R&D was particularly important in the short term with respect to companies' ability to keep up to date with, and respond to technology developments. Companies' inhouse R&D capabilities tend to focus on their core business and/or finding solutions to clients' problems.

"Manufacturing companies commented on

the problems resourcing R&D, including the difficulty in finding skilled people, constraints on company resources committed to R&D and/or niche specialisation precluding the use of external providers."

Additionally, the FRST report notes major problems in the transfer of government-funded research outcomes into the private sector. For example, the FRST report variously comments:

"There is a degree of tension between Foundation [FRST] investment strategies in manufacturing research which focuses on long-term horizons, and manufacturing companies' short-term development focus horizons.

"Less than 50% of manufacturing research has co-funding or partnerships with New Zealand manufacturers.

"Poor relationships and areas of distrust with research providers were evident."

The FRST report provides some support for our division between long-term, long-odds research as a largely academic exercise important to the future of New Zealand and to the supply of quality graduates, that should be equally balanced by the short-term, odds-on research that creates and implements innovation in the up-marketing of company product lines. Such a balance can only be achieved by more spending on inhouse R&D by businesses. The relatively low R&D expenditure by business in New Zealand is the likely cause for our trailing position in the OECD (see 'R&D outcomes' graph). Nations

of comparable size are ahead of us in patent applications in the European Patent Office and the graph points to the cause: the more money that goes into business R&D, the more patents come out.

So, where do we stand in terms of our expectations of how innovation is profitably implemented into new product lines by New Zealand companies?

FRST is clearly aware of the need for the second prong of our approach: more money spent on inhouse innovation aimed at up-marketing product lines and more high-quality technology-oriented graduates are needed to implement such innovation. FRST is moving down that track as effectively as it can, given the obvious political constraints, and the FRST report shows the various technology development funds managed on a co-funding basis with industry are well known and well used by the private sector.

So, in theory, both MoRST and FRST have much the same expectations for the structure of R&D as we have drawn from the overseas experience. In practice, however, MoRST and FRST have to deal with a skewed playing field in which the political clout of universities, CRIs, SOEs and other government agencies allow them to occupy far too much of the middle ground that has been left open by the isolation of the R&D expenditure of New Zealand businesses from more fundamental issues. This situation will change slowly, if at all, unless New Zealand business comes to the aid of MoRST and FRST by investing more time and money in balancing the R&D playing field. Moving New Zealand business R&D expenditure more towards fundamental research will enhance the ability of universities and CRIs to produce the technology graduates needed by business. In this way business will allow FRST to make the best use of the limited resources allocated by MoRST in keeping New Zealand's head above water in an increasingly technology and innovation-driven worldwide trading environment.

*In the next issue we will tackle the problem of raising the level of New Zealand business R&D expenditure outside of core business.

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