IPENZ Informatory Note Five

Wealth Creation in New Zealand
Improving Intellectual Property Realisation

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Wealth Creation in New Zealand – Improving Intellectual Property Realisation

There is strong belief that everyone in New Zealand should be able to live prosperously and with dignity in a stable society. Social and environmental policy, however excellent, will be at risk if we cannot afford it because we have failed to grow our economy. In two previous informatory notes (The Role of Engineers in Creating National Wealth – December 2000, Policy and Leadership Framework for Wealth Creation in New Zealand – May 2001) IPENZ suggested changes necessary to return New Zealand's economy to prosperity. The latter note outlined a holistic policy framework covering attitudinal change, education, intellectual property (IP) creation and realisation, compliance issues and enterprise transfer. Its specific proposals addressed many areas of the August 2001 "Innovation Framework" produced by the Prime Minister's Science and Innovation Advisory Council, though it was released earlier.

Professor Michael Porter, addressing the Knowledge Wave conference in August 2001, argued that the key to prosperity is productivity – the product of value generation and efficiency. The reforms of the mid-1980s created the economic framework for driving up efficiency; but value generation has failed to grow, the result being our slide down the OECD ratings. The task we face should not be underestimated – a return to Top-Ten status in the OECD right now would require our GDP per capita, expressed on a Purchasing Power Parity basis, to rise from the 2000 figure of $US19,400 to more than $US26,000 – a rise of one-third in our GDP, or an astonishing $US25 billion in total! In 2000 our export industries provide an income of about $NZ26 billion. To re-enter the Top-Ten now we would need to enlarge our export industries by much more than a third (if we were also to solve our balance of payments problem). We would need at least another $NZ10 billion, and probably more like $NZ15 billion in exports – the equivalent of at least three dairy industries – over and above current production.

If we translated this into a ten-year plan, we would need to create an additional $NZ2 billion in new exports and up to $NZ10 billion in new GDP each year. Knowledge-based industries have high turnover per employee, often approaching $NZ1m per person. Every year we would need to create 10,000 such jobs in new industries! This is beyond anything the existing venture capital industry can achieve by seeding small enterprises. To have any hope of significantly improving our position we must do something fundamentally different, not just tweak existing ways of doing things.

Public R&D expenditure at about 0.6% of GDP is not disproportionate. What is out of kilter is private R&D spending – at 0.3%, about one quarter of that of countries we aspire to be like. The Government R&D spend for economic growth is about $200m per year – this must lever at least $800m in private R&D spend to achieve the R&D investment typical of Top Ten countries. Alternatively, we can define a necessary leverage ratio of about $10 new exports per $1 of Government R&D spending.

Sadly, despite the much-vaunted reform of the Government R&D sector in the early 90s, and the continuing evolution of the Foundation for Research, Science and Technology since then, we have not achieved anything near this leverage ratio. Government R&D expenditure has largely gone to cost-reduction research to maintain profitability in existing industries, rather than seeding the creation and commercialisation of IP in collaboration with the private sector. Our business leaders have too rarely shown the vision to embrace innovation as the key to future success, preferring the comfort of familiar ways. No wonder our development of new industries has been slow.

A Conspicuous Exception – the Dairy Industry

According to Statistics NZ, in 1975 when the umbilical cord to the UK was finally cut, dairy exports were $289m (about $1626m in today's dollars), which trebled to $4728m in 1999/ 2000. In contrast, meat industry exports increased from $440m ($2471m) to only $3376m, an increase of about one-third, and the wool industry actually fell – from $263m ($1475m) to $1127m. If they had grown comparably they would be earning $7billion more right now – enough to secure New Zealand a place in the Top Ten.

In 1975 the dairy industry had no particular advantage other than a different attitude. Through its own endeavours it transformed itself from a commodity-based industry selling a narrow range of products to a limited market, into an internationally competitive industry supplying a wide variety of products (most with a high level of added value) around the globe. It has invested in successful new technologies from overseas as well as those developed at home, and created valuable international brands like Anchor and Anlene. It has secured many new and diversified markets. The industry funds 90% of its product and process development research at the NZ Dairy Industry Research Institute in Palmerston North, with only 10% Government funding. It is now embarking on a major self-funded drive in biotechnology, looking for lower-cost milk production, and a herd that produces more biochemically-active milk proteins. A modern dairy plant is the epitome of knowledge-based industry.

The industry has invested in an excellent workforce, using an integrated technology transfer model based on ease of movement of people between the R&D, production and marketing sectors. It recruits first-class graduates in engineering, technology and science each year, and places them in a hot-box learning environment; they undertake study for a one-year Masters degree in both the R&D environment and a production company. R&D projects involve production company staff, researchers, and often technical staff from the marketing arm. Many long-term industry staff have worked in all three environments. The continuing movement of technically competent people between the sectors of the industry is widely acknowledged as crucial.

Looking Forward to Success

One way to build industry rapidly would be providing incentives to attract international big business. Whether we do this or not, we still

need the private sector to spend at least 1.2% of GDP, rather than the current 0.3%, on the right types of R&D. We must make the $200m or so that the Government invests in R&D spending lever $800m directly from industry – an average co-funding ratio of 1:4; and there must be economic rather than scientific evidence of advancement resulting from the Government's investment. We must also accept that New Zealand must import much technology, rather than invent it all from scratch –new intellectual property can be developed from imported technologies.

Government funding to the Universities and CRIs must be made conditional on their developing partnerships with industry or other private investors, so that IP is retained and exploited. R&D providers must be assured that if they secure industry dollars Government co-funding dollars will flow to them. Long-running partnerships between research provider and client will promote people-transfer, which upskills industry and lifts the technological literacy of its decision-makers. Clusters will form – often comprising members from different industries with inter-related economic futures. Successful CRIs and Universities who build the right partnerships should not be restricted by funding caps, but rather rewarded for their successes. Such research providers will be able to pay premiums to bring home key expatriates and their technological knowledge. Yes, this sounds rather like the dairy industry, and perhaps it should.

A Robust IP Creation and Realisation Model for Industry

Learning from the dairy experience among others, we suggest that the following features underpin most successful IP realisation:

1. visionary leadership – directors and executive management who see the long-view business opportunities and target the right R&D accordingly
2. focus on market-led product and related process development, so that manufacturability is not overlooked
3. early commitment of private-sector funding to R&D, ensuring a long-term relationship between research providers and industrial partners, and continual testing of the relevance and direction of the R&D work
4. often reliance on secrecy for process and production know-how, but stronger formal protection of the IP for the saleable products themselves
5. involvement of marketers and researchers in long-term strategic planning, in order to maintain a portfolio of profitable IP
6. R&D effort at both the core of the business, and at the fringe; a balanced portfolio includes speculating (using a technology-push approach to find the sunrise products of tomorrow)
7. on-going movement of personnel between research providers and industrial partners, and a commitment to maintaining an excellent workforce
8. on-going cost-reduction research driven by the industrial partners, to ensure that the potential profit from existing products is fully realised
9. minimisation of capital utilisation on infrastructure (buildings and the like), so that capital is used to support competitive advantage

Improving the Government Contribution to IP Creation and Realisation

We have steadily accumulated evidence that an economy declines when Governments do not actively interfere. Government will not achieve change by persuasion – it needs to create incentives via public policy, or the urgently-needed fourfold increase in private R&D expenditure will remain a pipe-dream. The best way public policy can influence private-sector behaviours in the desirable direction is by making the desired behaviours into prerequisites for financial advantage. The other tools available to Government are oblique and indirect. Change in policy is long overdue.

While we seek to encourage private-sector R&D funding, we must not forget that Government R&D policy must also support long-term goals, maintaining intellectual diversity and capacity in our publicly funded R&D system. Considering the knowledge and economic goals of Vote RS&T, the most pertinent to wealth creation, we propose major change in Government R&D spending policy:

Knowledge goal:
Maintaining our measurements/standards systems is a role better suited to the Crown Research Institutes (CRIs); otherwise the Universities should be the preferred contractor for knowledge-goal funding. They maintain capacity much more cost-effectively through economies of scale arising from their research-led teaching programmes. Their need for scholarship for international bench-marking can be profitably aligned with national knowledge objectives. Strategies for human resource development in critical areas can be promoted by full-cost funding of CRIs for co-supervision of postgraduate research in Universities.

Economically valuable outcomes are a by-product of knowledge-goal research. Exploitation of such outcomes will be maximised when the ownership of the IP is vested locally in the host institution, preferably when that owner can easily engage with the venture capital industry at favourable co-funding ratios in the early stages (see below).

Economic goal:
We propose that the model of geared co-funding be adopted for all R&D seeking economic benefits. By gearing we mean that the ratio of industry dollars to Government dollars should vary according to the nature of the research:

a. efficiency gain or cost-reduction research: high ratio of industry to Government funding – the Government funding should provide just sufficient incentive for the industry to fund its own such work. In highly organised industries the ratio might be 10:1, whereas in fragmented industries a ratio as low as 1:1 may be needed temporarily. The appropriate ratio can be gauged by economic rather than scientific analysis.

b. development of new products by existing industries: when the R&D is embryonic the ratio of private to Government

might be as low as 1:10, changing as the development approaches market – perhaps past 1:1. CRIs and Universities must know that if they engage with an industry to increase its R&D commitment there will be no arbitrary cap on the co-funding from Government.

c. development of new products in new industries: this may require some Government speculation, but by setting the gearing ratio as generously as 1:10 and moving to stimulate venture capital, Government can build successful small to medium enterprises (SMEs). Much of the funded research will not be to develop the initial IP, but rather to develop means to realise it (e.g. to overcome manufacturability problems).

Closing Remarks -What is Success?

That the Foundation for Research Science and Technology has come to think of itself as an investor is to be applauded, but why did it take so long to realise that the CRI system of the 1990s did almost nothing to lift our economic growth? The over-complexity of the systems used to allot Government funding and the number of agencies involved (Industry New Zealand being the latest addition) remain a concern.

It is often said that we must focus. Charging too many agencies with assisting industry will not help. Focus is about identifying the means to expand our IP creative output and then realise it economically. It does not involve spending more on blue-skies research, choosing an industry (e.g. the food industry) or a technology (e.g. biotechnology), or building more stand-alone silos of research excellence. It requires hard-nosed concentration on getting technology transfer and associated relationships right. It involves directing the CRIs to grow the New Zealand economy, almost to the exclusion of other objectives. Appropriate focussing will lead to the quick development of new $1000m+ industries – there is potential in IT, electronics, software, health-related biotechnology, health-enhancing foods and education, but can we realistically expect a new apple cultivar, or sauvignon blanc, to succeed on such a scale?

The success of tomorrow might come in unpredictable ways – a need for communication in the forests of Finland led to Nokia. We need flexibility about where tomorrow's most valuable IP may come from, and focus on co-ordinated, simple support systems to harness its benefits.

The 1960s and 1970s Research Associations, from which the modern Dairy Research Institute evolved, were co-funded 1:1, and they unashamedly worked for the economic benefits of their industries. They were governed more by the industry than by the Crown, and those that grew encouraged staff movement to and from their industries. Perhaps a modern version of the Research Association with variable rather than fixed co-funding is the ideal Government instrument for dislodging the value-creation and realisation blockage the nation still suffers. Simple models are often the best.

Other Informatory Notes

Note One: The Roles 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

For more information contact
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