Transforming NZ companies through innovation

NZ Product Accelerator

Level 2, Building 903
Newmarket Campus, University of Auckland
314-390 Khyber Pass Road, Newmarket, Auckland 1023
Private Bag 92019, Auckland 1142, New Zealand
www.nzproductaccelerator.co.nz

Future Pathways - Green Paper Submission from the Product Accelerator Submission #1,

Executive Summary

This submission contains general feedback about the science and research system in New Zealand, from the viewpoint of industry and the collaborative R&D network we have piloted and grown over the past 12 years.

The Product Accelerator is a collaborative venture among Industry, Universities and CRIs that focuses on filling recognized technological gaps, utilising the best available project teams (nationally), to create enhanced prosperity for New Zealand. This starts with listening to the practical need in the community or enterprise, and collaboratively identifying the missing piece of science which can rapidly meet that need. This process has come to be known as 'industry pull' and will be referred to in both submissions 1 and 2

The key questions raised in the MBIE Green Paper are addressed in Section 3, although some of these are inter-related and have been combined in the feedback here. More detailed feedback on the questions and the Green Paper sections themselves is provided for the purposes of research system design, in Submission 2.

In producing this Green Paper response, we are motivated by a belief that as a country we have somewhat iteratively lost our way in both how we decide what science to fund and also how we go about merging science interests with commercial interests – particularly in advancing New Zealand's manufacturing and knowledge-intensive industries. We believe that some change is highly necessary and that it should feature the following:-

- More focus on funding strategically important or beneficial science (discussed in the Green Paper as 'National Research Priorities')
- Less focus on the current concept of "stretch" as applied to science quality assessments
- A rethink about CRIs (as prompted by the Te Pai Kahurangi report) to focus them on strategic science capabilities that need to be core funded, plus specific technology platform contracts or collaborative research with sector stakeholders
- Acknowledgement that collaborative science models like the Product Accelerator, the Bio Processing Alliance, and the National Science Challenges have shown the greatly enhanced benefits from collaborative research, and that more of the same would be ideal

- Less of a focus on the traditional concept of "science or research excellence" of any applications for contestable funding and more focus on whether the targeting of the proposed science is right for New Zealand's short and medium term needs, whether it is to be truly collaborative, and the quality of the team assembled to address the science gap to be bridged – a 'best team' approach encompassing both the research expertise and excellence in application in industry is needed in each of these teams, as well as robust project leadership.

Key Points of Submission 1.

• A key part of achieving an increase in GDP per capita that is sustainable is focusing on enhancing and developing business in technology-based manufacture (known more commonly as Advanced Manufacturing).

• This needs a change of focus in a number of areas, but particularly in funding and governance of the NZ Innovation system. Key changes needed include:

- **Focusing on "pull" science, not "push" science, i.e. science that will create new "Sticky Business" for New Zealand**
- **Developing an innovation and science eco-system and structure which addresses known opportunities for niche technology-based business for New Zealand**
- **Re-defining what is considered "good" science with a bias towards development of a stronger, technology-led, economy.**
- **Ensure that "Industry Pull" drives the identification of science gaps in economically relevant fields, with that 'missing science' then being investigated by the best available teams, led by governance that is Industry and community-centric. This approach has been piloted in the Product Accelerator and found to be effective in increasing project success rate and value.**
- **Re-thinking parts of the educational, and vocational training systems to provide a work force that is more (unashamedly) biased towards the highly productive parts of the economy.**

The following sections of this document are written mainly from the viewpoint of firms in the productive NZ sectors of the economy (our clients) and our Advisory Board. Many of the observations were originally made in our submission to the Productivity Commission on Frontier firms.

Section 3 attempts to address several of the Green Paper Key Questions directly. The second Submission (2): 'Key Points in the Green Paper' addresses the Research System itself, and the key questions in more detail, with feedback on system design from our experience over the last 12 years.

Section 1: A Community Viewpoint: feedback over 2010-2020 about how the business and entrepreneurial community find the Science system to work with.

Firms find dealing with NZ's extensive and highly sophisticated science and technology capability so difficult and expensive that they avoid it, choosing instead to recruit their own specialist advisors (mostly from overseas), or look to customers for assistance. To compound the difficulty firms find in dealing with the Science system, there has been a slow creep in what is judged "good science" amongst governance of the Science System, away from outcomes that have immediate potential commercial applications towards "stretch" blue skies, far-horizon science. To quote some of the comments made by respondents to the "Powering Innovation" report: -

> • *Publicly funded research organisations are set up as industry independent research providers and are not generally linked to a particular niche manufacturing sector or particular enabling technologies or platforms. Therefore, there is little networking and or interaction and companies do not identify with those organisations as being 'their' research providers.*
>
> • *… none of the CRIs see it as their main role to visit companies to assess their needs and sell R&D services to them.*
>
> • *Research organisations were not structured to perform contract or commissioned R&D in a commercially competitive manner.*
>
> • *The way government funding is structured is a barrier/R&D grants favour big companies, not 'cash-strapped' young and/or developing companies.*
>
> • *… the level of cynicism/distrust of government funding mechanisms, arising from negative experiences around onerous processes, compliance rules and conditions that limit the practical effectiveness of the support and funding streams were "a tangled web."*
>
> • *Research organisations historically developed IP in isolation, which led to solutions to problems that did not exist …*
>
> • *We have found that very little of the R&D expertise in New Zealand research organisations is directly focused on delivering targeted output to business and industry.*
>
> • *CRIs at times were expected to pursue research and commercialise it and, at other times, were asked to assist industry without having deep competence and were therefore unable to provide value to business and industry customers.*
>
> • *IP was a barrier to companies using research organisations for R&D. CRIs have a 'we own it, you get no benefit' mentality and that universities are too rigid in their one-third (university), one-third (department), one-third (researcher) ownership and reward model.*

- There is no incentive for business to engage with research organisations.

- *… it is quicker, cheaper and better to do it yourself by using existing in-house staff and/or recruiting talented R&D-capable graduates.*

It is essential that there is reform of innovation and industry policy settings so that we develop a new cohort of frontier firms in New Zealand, fit for an advanced technology and manufacturing future -

- that have much easier access to NZ's science and technology capability and identified platforms,
- that collaborate within and across sectors both up and down the value chain,
- that collaborate in sector related R&D development, and
- that have access to sophisticated NZ government – based venture capital investment funds to avoid forced dilution or exit during transition to commercial maturity and the consolidation of activities in NZ.

The reason NZ firms find it hard to get quick, flexible, affordable interactive help from the science system is simply that the system isn't designed to deliver this. CRIs and Universities tend to be focused on delivering on major research grants, such as the Endeavour or Smart Ideas grant schemes, and supporting small business is less appealing, less profitable and distracts seasoned researchers. Commercialisation units such as UniServices and Vic Link, if approached, can broker a research study into a firm's request. However, this potentially leads to a report with no implementation outcomes or even a possibility of one. The CRI Industrial Research Limited collapsed because it simply priced itself out of the market doing this: it had about 10 customers when it was closed. The universities also find it hard to engage with small businesses for similar reasons, but also because they are set-up to provide Research, and the PBRF funding programme discourages technology development or transfer, rather focusing on academic outputs such as research journal publications, rather than applied outcomes in the community. Promotion criteria in most tertiary institutions also tend to focus on these, with career consequences for academic staff.

Section 2: Key issues identified during the recent feedback sessions with MBIE on the Paper.

Issue 1. Core funding versus Contestable Funding

This issue is an employment matter really. It is not about science or even the benefit of the system. Core funding is needed by CRIs and, through the PBRF mechanism by Universities to ensure sufficient revenue stability to employ researchers and academics. Contestable funding (in theory) allows these institutions to collaborate to achieve science outputs, although not real outcomes.

However the issues of system purpose (i.e. the national benefit of science, research and technology), and the stability of employment of scientists and engineering researchers are hopelessly confounded in the current system. This needs to be resolved, especially in regard to the CRIs who have structured themselves into profit/loss making corporations to try to achieve employment stability. Inter-institutional competition is common.

Issue 2. Public Good versus Commercial Benefit

There is a strong prevailing myth in the Science System that Public Good is diametrically opposed to commercial benefit. This is despite the fact that the taxes of exporters and other productive enterprises contribute to the public services we enjoy. From the perspective of employment and the general community, New Zealand needs to embrace commercial benefit if it can be implemented in the Public Good. The two things are not opposed, and in fact an exporting, sustainable island nation must embrace commerce. This is a challenge New Zealand faces, but can only be successful through harnessing the RST system.

Issue 3. Science Impact versus 'Excellence'

Another prevailing myth in the science system, and especially with science academics, is that science excellence can somehow be assessed independently of the degree of difficulty in its implementation. New Zealand is perhaps the only country now to cling to this dated belief, as evidenced by our disconnect between research papers and innovation (Powering Innovation report) and by the failure of our PBRF system to generate more innovation impact through science and engineering research.

Impact now needs to become our main criterion, but this will require a much deeper understanding of the mechanism to achieve impact in the commercial world, whether the benefit is through exports or through environmental, climate or social improvement.

Section 3: MBIE Questions to be addressed.

1. **What principles could be used to determine the scope and focus of research priorities?**

NZ decides where it will do government-funded science through two programmes. The first is via the outcome of highly contestable funding programmes (Marsden, Endeavour, Smart Ideas). The second is where teams of scientists make choices through the CRI core funding and the core or PBRF funding received by the Universities.

The contestable funding programmes dominate the science spend, but the whole process is unbalanced in our view with the vast majority of programmes directed by government to support stretchy blue-sky research, and far too few on economically relevant science. This deeply skewed system is further undermined by the scientist-only selection panels. There is a good argument for the Marsden blue-sky fund, but the remaining funds should be allocated in our view, with an economic bias, and with the much stronger involvement of leading businesses, community organisations and CEOs.

Further, MBIE's various programmes are overly focused on basic research and not on technology development. The latter requires consideration of the wider aspects of business such as pilot plant and prototype development, engineering systems/real world interactions, skills development, and early-stage market assessment. Small and medium-sized businesses do not want R&D in the traditional sense: they need fast solutions for low cost, and often D without R. This is a distinct feature of the food and beverage sector, where innovation is a continuous process of incremental product development. Here, as elsewhere, high R&D does not necessarily equate to high levels of innovation.

A critical weakness of science and innovation policy in NZ is that the innovative, advanced manufacturing and other frontier firms are not at the table and have no coordinated voice or position on MBIE programmes or planning. The science community is highly organised and dominates the system. We have a chief scientist reporting to the PM for example. Leaving out the R&D tax credit, approximately 90% of government funding in this area currently goes to untargeted science (as the diagrams in the Frontier Firms report show): surely this is a luxury NZ cannot afford.

2. **What principles should guide a national research priority-setting process and how can the process best give effect to Te Tiriti?**

The defining principle for NZ priority setting in the current urgent global context needs to be completely different from the somewhat academic star-gazing previously employed. Te Tiriti, community and business needs, in a 5-year timeframe must now become the driver. R must now become R, D&D (for Deployment), with real world outcomes in 1-2 years after inception. Teams need to be assembled with the requisite

mix of cultural, science, engineering, and business experience up front, with some team members drawn from Māori and Pasifika communities through both R&D network structural design, and engagement processes which are inclusive and based on genuine relationships developed over time. New Zealand is ready for this R&D engine, but it will require a major change in criteria used in project selection from the traditional view of 'science or research excellence' to real world impact, in a holistic socio-economic and environmental sense. This design is discussed in more detail in our Green Paper Submission 2

3. How should the strategy for each research priority be set and how do we operationalise them?

A live 'Menu' of 'fundable' science and technology questions for investigation by NZ institutions (CRIs and Universities) should be created and would include the identified science or technology gaps to maximise New Zealand benefit now and in the immediate future. This would include those recommended by an expanded NZ Accelerator through its wide network of Industry and Academic practitioners, and entrepreneurs. Note this is a 'pull' process in which people with deep industry knowledge guide and lead the definition of technology gaps to be addressed: this is a lesson learned the hard way through the precursor to the NZ Product Accelerator, the Materials Accelerator.

The Fundable Menu would be operated and updated annually by MBIE with the objective of re-balancing research in NZ so that a fixed proportion (say 50%) of new investment each year is directed to increasing triple bottom line value for New Zealand within a 5-year time horizon. Successful, real-world outcomes by an R&D team over this time frame, with outcome milestones at 1 and 2 years in, should be rewarded with additional funding provided the refined or next value proposition (and results), continue to stack up. This will result in growing stronger teams.

The above changes would require a significant proportion of R&D outcomes to be achieved in 1-2 years from inception, and to be integrated tightly from the very beginning with industry innovation. That is, the 'industry pull' model such would need to be followed.

Over a period of more than a decade, a pattern of advanced and knowledge intensive technology platforms have evolved in several networks, including the Product Accelerator. These platforms of R&D underpin many of the technology solutions developed for businesses and entrepreneurs, and, together with others, could provide a base set of 'work areas' where further R&D investment will provide larger opportunities for NZ.

9. **How do we design collaborative, adaptive and agile research institutions that will serve our current and future needs?**

   And

13. **How do we better support knowledge exchange and impact generation? What should be the role of research institutions in transferring knowledge into operational environments and technologies?**

Each University has a science commercialisation programme which to quote one '……. *connects entrepreneurial researchers with experts who are focused in their area of research. We help ideas become reality by wrapping a team of specialists around the researcher and their invention to see it through to success. By testing, protecting, and shaping ideas, we help create them into real-life applications that solve problems and change lives.'* In our view a great deal of effort and money is wasted by Universities and CRIs, in trying to **push** new science into some form of potential innovation. This model should be replaced with an industry **pull** process, where firms and people with deep industry knowledge can guide identification of technology gaps, through interacting and accessing new science and technology. This leads to rapid evolution and application of new technology, as well as agile research into the 'missing science' identified during the pull engagement process above.

15. **What impact would a base grant have on the research workforce?**

A base grant for CRIs to maintain and improve tightly defined areas of expertise, would allow these institutions to contribute to cross-institutional networks which are focused on the national research priorities of New Zealand in an unconstrained way. This currently cannot happen because the CRIs must compete for about half or more of their funding in the untargeted, stretch science research funds (competing against each other to some extent and against Universities).

The base grant would be dependent on the CRI actually contributing to, and in some cases leading, the research and the outcomes in nominated national research priorities. This would provide accountability for the CRIs, but also ensure a 'best team' approach to solving real problems, through the growth of collaborative network structures such as the Product Accelerator. In these collaborations a 'best team' means one with the requisite depth of industry experience to apply technological solutions, as well as the capacity to go deep into global research expertise to find specific scientific answers. More discussion is given on these networks in Submission 2.