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Dr Patrick Nolan
Director
Productivity Commission

By email

NZ firms: reaching for the frontier

This is a brief note on the issue of building world class industries from the innovations likely to come from the science system, and to help make them sticky in NZ. It touches on Chapters 6 & 7 of the Draft Report.

My comments are based on 20 years helping to commercialise physics and engineering technologies in NZ, assisting research organisations win research funding, and contributing to getting these innovations into market¹. I also draw upon insights from earlier work while CEO in the then NZ Manufacturers' Federation² and to a lesser extent earlier work when responsible for a directorate in the SSC overseeing efficiency and economy in a third of the public service.

There are many potential pathways to build world class industries from innovations. Here I am addressing the narrow situation where innovation is occurring where the local industrial base is relatively weak (so limited opportunities for clusters³ or significant market pull⁴) and the innovations are addressing more basic inputs to industrial products rather than just finished products⁵.

Both are typical of physical sciences based innovations in the NZ environment, particularly materials technologies that tend to suit the scale of NZ's science capacity but the absorptive capacity of NZ's industries, at this level tends to be weak.

¹ I also work closely with the research sector in my role as CE of the National Energy Research Institute, but would stress these comments come strictly from arnold.co.nz, and do not represent the views of any other organisation.

² See Peter Crawford's submission (DR 034) for some more detail.

³ Cluster development is referenced in a number of submissions, and while no cluster might exist the process being described, if successful, could potentially lead to cluster formation.

⁴ There are situations in NZ where there are well functioning innovation systems around innovative firms, but these are not the area of concern.

⁵ Akin to what MacDiarmid (Sub 20) refers to as "deep technologies".

The development process is important when exploiting these opportunities. It is not just how to create international scale and competitiveness: it is how to build a system in NZ that does it more reliability (with less risk) and more quickly than our competitors.

Thus, analysis of endpoints (existing frontier firms) is less valuable than looking at the dynamic that produced them. What we see today on the international stage is the product of a range of forces and how useful these are for working out interventions at the early stage is moot.

Beyond that there is also an underlying assumption in what the Commission is seeking to do that we want these commercial developments to be somehow sticky in NZ i.e. we wish to maximise the economic returns to NZ. This will influence the nature of public interventions/investment that will be regarded as acceptable.

With these comment in mind, I would make the following brief comments⁶:

- Public intervention early in the life of innovation occur in an environment of considerable risk and uncertainty. But there are techniques for managing these risks, particularly better understanding the risks, maximising options, building portfolios and exiting poor investments quickly.
- Favouring interventions that give a good chance of being sticky in NZ means not just exploiting local resource endowments etc – increasingly the lack of these can by compensated for. It means ownership of value chains and direct control over the key bits. Investment in narrow innovations⁷ or building companies that are not integrated into a local value chain⁸ works against this.
- Because we want speed (and fast fail) local value chain growth will need acquisitions from overseas. Doing this and retaining control here means having a strong negotiating position built from high value capability already well anchored in NZ.
- This suggests an innovation system producing the kinds of technology developments I am focussing on should be funded with these wider outcomes in mind⁹.
- This means:
 - Investment in the development of world class platform innovations – those that have the potential to reach critical mass in the science and technology and enable developments in multiple applications¹⁰.
 - No individual technology development makes a business, and in the industrial sector particularly novelty in one part of a system will require innovation elsewhere. Investment in the system rather than just the initial innovation will help consolidate the commercial activity in NZ. This needs to be within the definition of platform development.

⁶ I would be happy to discuss in more detail anything that might be of interest.

⁷ For example the practice of specialist innovations being simply licensed in its own right.

⁸ “*World famous in NZ – How NZ’s leading firms became world class competitors*” (2001) C. Campbell-Hunt et al (surprisingly not appearing to be referenced in the draft report) draws attention to the relative isolation of the then NZ leading firms.

⁹ This suggests a more complex development pathway than normally addressed by individual start-up/spin-out companies.

¹⁰ This support should be contestable against defined criteria, but once recognised as successful should attract more stable long-term R&D funding.

- The objective should be that the developments are of sufficient value and sufficiently integrated into capability already sticky in NZ that international companies will be willing to establish at least part of their operations in NZ to gain access to it.
- At critical points in the development of these platforms industry policy should bring in support in appropriate elements of the value chain^{11,12}. This implies among other things support to build wider specialist capabilities (e.g. skills, finance¹³, market access).

The innovation system does have the basic structure to move in this direction, but the suggested funding criteria are not explicit¹⁴. Looking forward there are TEC/MBIE innovation funding streams that are long-term and could be expected to produce further platforms¹⁵. This expectation is most explicit in the case of the recently funded Advanced Energy Technology Platform.

Beyond that the availability of industrial development assistance aligned with this and offered as an explicit pathway to the innovation is currently ad hoc (i.e. Space).

Both these directions could be usefully formalised, and if successful expanded.



Simon Arnold
Director

¹¹ Note this is not a group of firms all doing the same thing, it is specialist firms that are adding value to each other.

¹² There have been examples of this. A decade ago NZTE had a short lived programme of export development based on developments in titanium alloy powders and HTS. Inductive power transfer is another platform that has largely developed under its own steam. Space is currently being developed in this way.

¹³ This is something the film industry in NZ seems to have managed to develop but has been notoriously difficult in the industrial sector. The issue is the high degree of specialisation required in the latter, and a high perceived risk where this does not exist. This will inhibit the significant investments required to get these kinds of development into international markets.

¹⁴ There is now a strong emphasis on international linkages at the science funding stage but this specific interest in attracting international capabilities during commercialisation has not been so explicit.

¹⁵ There are two TEC funded CoREs in the industrial area: *The Dodd-Walls Centre for Photonic and Quantum Technologies* and *MacDiarmid Institute for Advanced Materials and Nanotechnology*. MBIE has funded the NSC *Science for Technological Innovation* and the three Advanced Energy Technology Platforms: VUW, *High power electric motors for large-scale transport* (in part continuing to build on the HTS platform; UoW *Ahuora: Delivering sustainable industry through smart process heat decarbonisation* and UoC *Architecture of the future low-carbon, resilient, electrical power system*.