Kia ora,

I am a senior science manager, with 20 years of experience working in the science system.

These are some of my thoughts with relevance to a high functioning future system, from my perspective as an individual submission.

Motivators of science

Our current system stifles innovation and pits people against each other.

Scientists & engineers (SEs) have been on the bare bones for years if not decades, with SEs feeling not valued and treated as cash cows. CRIs are set up as business, in the face that scientists are largely there for public good. The business mentality creates unwanted competition & drives counter productive behaviour. When that focus has been on running as a business, ie bringing in commercial revenue, at the expense of, as is their act, to create value. Liability, rather than asset, thinking. Running everything as a business is systematically destroying and staff are extremely low in morale. You can't keep making new KPIs of making scientists more & more into cash cows when this goes against the nature of what has attracted people to work for public good. People are already tired, stressed & mentally worn out and it's hard to see that the efficiency drive will do much except to make that worse.

The scarcity mindset we have been operating under, drives competitive behaviour. In a country the size of NZ, we must collaborate over competing.

Despite having a good career in science, I feel discouraged from my own kids taking science subjects at school. There are so many initiatives to encourage kids into STEM pathways, but even after PhD level, few are working in STEM after only a short time. It is really genuinely hard to find good jobs as scientists. The system is particularly leaky to mothers. We also waste most of our expertise, within 2 years of a PhD, 80% of graduates are already working outside their field. People with lower level qualifications often find it very hard to get jobs in science.

It's widely accepted that prosperous countries have succeeded through technology, the application of science. So why then must we persist in undervaluing those that have the potential for this?

Expense of science

We must also recognise science is a very expensive pursuit, and so much of the high value technology is founded on critical masses that small companies can not reasonably hope to have. As Paul Callaghan noted, we must utilise the potential from universities & CRIs (and indeed now, Callaghan Innovation).

We have put effort into thousands of small companies that couldn't hope to add up to much, despite much discussion for more than a decade of noting that the top 100 weird and wonderful, that has the potential for 500x leverage, looking globally. If we compete in areas that are better resourced in many other places, we shouldn't expect to play a large contribution.

Future focus

We need more potential for disruptive science, demand led research doesn't always achieve this. Need to be able to pivot. Market pull is not the only answer. Take the example of Henry Ford "If I'd asked people what they want, they would have said faster horses", or more recently, the iphone.

Now it seems for every scientist/engineer, there are many more people trying to succeed by formula. Perhaps the missing key is not to pile more & more people to assist greater than exponential growth by harnessing science in a way that stifles it, but to create a level environment.

We need foresighting ability, people who have insight into opportunities to develop strategy. Need flexibility, if we focus too much on big rocks, we'll be competing with the rest of the world, many of whom are vastly more equipped than us to develop tech, eg cleantech, and we will be left behind, unable to pivot

We also can't optimise for a "now" perspective, need to look to the future

Disparity

We should recognise that many of the governments goals are admirable but more political than caused by a lack of science, eg Lower emissions, Improving housing, Addressing poverty. These are primarily issues of disparity, not lack of technology. We need to support priority areas by creating things the world wants but doesn't have, so we can use our 500x lever.

We can't create increases in disparity. If a few people become rich off other's backs, eg there are substantial numbers of staff on below average pay), the net productivity is flat. Wealth creating needs all people to benefit from it. Trickle down economics doesn't work. Enormous gains in productivity, but all that is happening is many people working hard in low paying, undervalued jobs to make a few people obscenely rich.

In the previous century, despite a depression & 2 world wars, productivity was exponential, all without the enormous resources being put into commercialisation. The standard of living was significantly lifted across the world, however it was not evenly distributed. In NZ at least, our Gini coefficient has increased and so we have succeeded at redistributing wealth so a small proportion of people have profited, while many more have worked long, hard hours with low pay to enable them.

Need to consider indirect wealth creation to solve these problems. Paul Callaghan's vision was that we make money where we can, particularly from deep tech, to support other areas that are valuable, but without the financial return.

Gap in targeting financial return

Since IRL was disestablished, there has been no organisation with a purpose of industrial research. This has left a gap in this area. A lot of current system in CRIs was set up for '90s technologies, food & fibre. Need much more emphasis on deep tech, added value.

We need to pool commercialisation support and focus on bringing overseas money in, otherwise we won't be able to shift the dial here. We must avoid small incremental areas that don't change much and maintain a portfolio approach.

Aspiration of R&D levels

The aim of increasing R&D to 2% of GDP is low. We are aspiring to be below average while the world is increasing. We are already looking to the past when we try to match R&D to what NZ companies are doing now. I also question, how much real R&D do our companies really do?

Scientific literacy

We also need to deal with misinformation as one of our biggest threats, science literacy is increasingly important but our schools are unequipped to do as well as we need and too much of the population are scientifically illiterate. Much of school science unchanged since I did it 30 years ago, but the scientific world has moved fast. School science now is more like science history, where students have been taught about what has happened in the past, but only scant information about fields they would actually work in. It's not necessarily harder to teach these skills either, but requires change.

The PBRF scheme:

PBRF causes issues that hold us back. The drive to publish means that scientists share their ideas globally with a world better equipped to take them & develop them further than we can, due to our lack of resourcing. We are giving away IP. Publications can be a negative for nz - consequence for PBRF

Using our IP effectively

We waste most of our good ideas. 90% of MBIE funded projects are unsuccessful, when organisations only put forward outstanding opportunities in the first instance. Could we have some of the funding of the mass of policy/strategy etc people diverted instead to enabling more of the research, or find alternative mechanisms to support it.

There is a scheme in the US where post grad students can take the IP from their thesis for 3 years for free, to try to start their own companies, if not successful, reverts back to to the university after 3 years. This is worth exploring here, & expanding to CRIs & CI. We must recognise it takes time to create IP, much longer than publications, so provide extra support for EMCRs, people changing fields to get established. Thank you for the opportunity to give feedback, I would be happy to be contacted for further discussion.
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