

Opportunity, Risk and Reward: A Personal View of Science and Technology in Australia

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Abstract

This paper reflects a personal view of the development of Science and Technology (S&T) in Australia from the passionate setting up of the first universities in the 19th century to the rationalist demand of government in 1985 that CSIRO should obtain thirty per cent of its earning from external sources. The most recent view of the sector and the demand for commercial return to S&T is best understood in terms of defining Australian motives, goals and strategies. Given that Australia can never hope to emulate the US and European models, we must devise and work to a new model – one that best serves our strengths.

Introduction

Science and Technology has held many positions in the minds of Australians over the past century. From the formation of the first Universities in Sydney and Melbourne in the 19th Century through to the formation in 1946 of the Australian National University a cultural will was evident that we Australians wished to be seen as world class participants in progress through intellectual excellence, as much as we wished to be seen as top stockmen and athletes. Although commonly described as a cultural cringe, this period was driven by a deep belief in the maturity brought to a young culture by knowledge, of which science and engineering were a major part.

After World War II, our belief in science was totally vindicated by the linking of scientific knowledge with world power through the Manhattan Project, Hiroshima and the Cold War. This belief grew from passion to

religion during the 1960s and peaked with the first footprint on the moon.

However, even by 1962, with the publication of Rachel Carson's 'Silent Spring', an accusing finger was pointing at science as having gone too far. Caught up in the social churning of the civil rights movement and the Vietnam War, science and its progeny of technologies were coldly reviewed and with very few defenders, found to be untrustworthy and requiring tight external control.

The first tangible evidence of this shift within Australia was the declaration in 1985 that CSIRO would meet a 30% external earnings target. This, in one stroke, caused the already aging but still highly respected research organisation to terminally lose its direction. It became confused as to whom it was serving, whose money should pay for it and who should be financially rewarded, should anyone be successful.

On the international stage, the popular image of science had moved from the moon to environmental damage and corporate greed. The image fixed in the minds of government and business was of overspent budgets and unfocussed activities. During the post-Dawkins era it was assumed science was there for an economic outcome, that it should be driven by government and business, and the big question was simply how to make it happen. The lawyers, patent attorneys and consultants grew fat.

Some within the Science and Technology groups prospered. Most became lost and

dispirited. For the last decade the stayers in the scientific community have grown old. Some have retired; some have kept their jobs by doing less science and more, much more, administration. The once clear concept of a career in science evaporated. To contemplate becoming 'an academic' required that one knew what students should be taught and even more that we understood why we were teaching them at all.

The following comments are directed to these questions and although not researched to the depth these issues deserve, I offer my observations from over a decade at the boundary of science and its application for commercial return. The problem is simply to define our motives, our goals and our strategy.

Motive

Across many societies I propose that the attitude towards science and technology broadly correlates with population size. This proposition is shown below in Figure 1 in terms of the three major motives of cultural, economic and strategic.

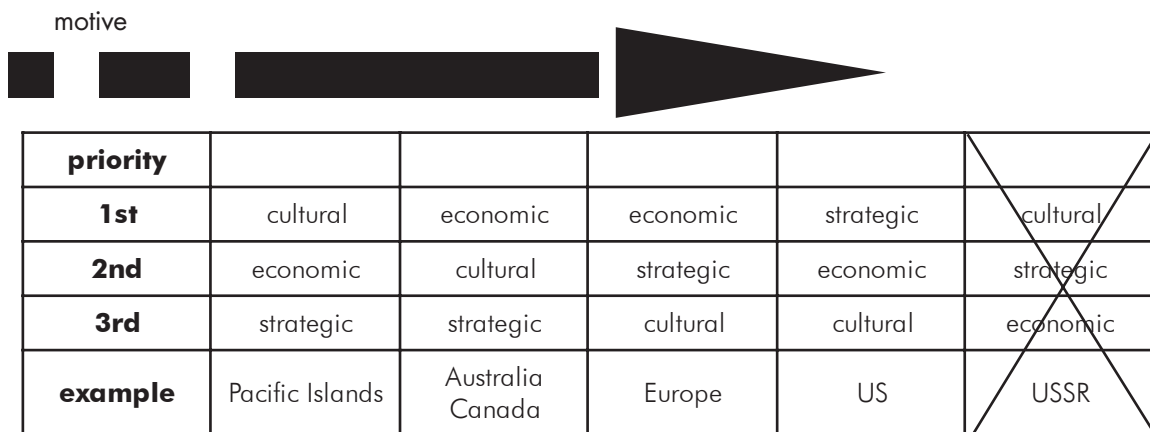
A shift from cultural to economic justification

for science and technology has, in Australia, run parallel with the slow realisation, post WWII, of the true extent of our isolation in the world. Along with Canada, which for other reasons is in the same category, we are unlikely ever to have the resources to achieve an alliance between the economic and strategic justification for Science and Technology. The absence of the alliance of the economic and strategic motives means that most Australian start-ups using the US and European models are doomed to fail through lack of the services and networks essential to surviving. This is a problem to which Australia has not yet admitted, let alone solved.

Goals

The goal then is to define the problem and then propose a strategy for its solution. The goal must be based on a big picture view. Let us start with the multiple tiers of society: school room; the university; R&D and business. The only group that is empowered to intervene at this level or has any interest in doing so is of course the government. All of these groups must be engaged, although it is for government to sound the alarm. At present, despite good will and intent, I suspect the problem is not even appreciated. The minimalist Goal is to have the problem recognised.

Figure 1: A proposed trend in motive for pursuing science and technology across small to large populations².



Issue I. Secondary School

It is evident from presentations I have given as an invited speaker to careers nights that the best and brightest secondary students are still driven in their early years by curiosity. Not surprisingly, teachers are obsessed with vocation, but the students remain fascinated by how things work. Curious about both the workings of machines as well as at the structure of organisations. There is no shortage of potential for change and new directions from this group.

Issue II. University

The upper levels of the secondary system and throughout the university system, curiosity has been replaced by a focused and furiously competitive chaos. The norm when invited to talk to students at any university in any city in Australia is to find that most of them are either pursuing an ersatz financial services career and that they have percolated into the class because other options were unavailable. In most circumstances they are mistaken in their understanding of career outcomes. Only a tiny fraction are there because they have thought it through.

Issue III. Research and R&D support

At the research level an even greater confusion over motive prevails. Most researchers are now attempting to follow models of R&D start-ups proven in Europe and the US. However, they fail to appreciate that the essential ingredients for a successful start-up include a domestic market ten times the size of the Australian domestic market and a military-industrial complex, which Australia does not possess. A further symptom of the absence of a military-industrial complex is the absence of the contractors and suppliers that this complex generates. As a result companies such as my own are driven to go to the US, Canada and Europe to obtain the services of contractors and engineers. This is notwithstanding the efforts of CSIRO, CRCs and Australian

universities all attempting to establish industry support groups. The disconnect is that Australian industry is too small a market for any of these suppliers to grow to a size to provide the required standard of service that Australian industry dare depend on.

Issue IV. Market Size and Focus

All of the forgoing issues assume that the chosen markets for Australian technologies are accessible and large enough for a return to justify the effort. This is a hard problem but not impossible. Although it is improbable that Australian S&T outputs will ever challenge the value of the Australian resource-based economy, international interactions are complex and we should never relax our drive to be technical leaders in niche areas. In fact, as a small economy, one of our marketing plays must be that we are the best in our chosen area. Forget offering broad services, the larger economies will always dominate in the lower risk, more straightforward markets. As a small, intelligent and polymath society our advantage is to excel in the off-beat and the novel. The guiding rule is that we must choose to be the best in that chosen area.

Strategy

Despite what sounds to be a pessimistic message, it is not. It is simply that Australia must work to a new model, different from that of the US and Europe. Furthermore, one of the unexpected opportunities that exists for Australia is the rapidly aging core of US technical knowledge. Attending meetings with US corporations during the past decade I have met with a steadily aging population of technical specialists, most of whom are now in their mid to late 50s. The US has attempted to make up for this rapidly aging population of their expert technical talent by feeding off their equivalent of the colonies. NIH, NIST, NSF and the US corporates are brim full with Africans, South Americans, Indians, Russians and Asians, who in most cases do not have green cards and who are planning to return to their native countries and good jobs with the status of their newly-won US experience. This situation has been accelerated by the new era of terrorism presently gripping the world.

Recommendation no 1. *Encourage students, particularly at the post graduate and post doctoral level to take advantage of this shortage and push for positions in the US.*

Concerns over the loss of the young and talented from Australia that this recommendation may elicit are, I think ill-founded. Lacking the essential ingredients of an Australian start-up community, we must develop networks into the world of those that have them. Australians remain Australians regardless of where there are working. Family ties and sentiment have an uncanny way of returning expatriates to their home countries and with that return will come the networks Australia so keenly needs. An economic motive for our Research & Development means this is a must.

Recommendation no 2. *Offer scholarships for Australians to study, work and develop International networks.*

The rule is simply to internationalise Australian students, scientists and engineers as soon as possible. This recommendation is saying we should not only encourage the fastest growth of international experience in Australia, we should actually help pay for it. Incidentally, the growth of the Asian economies is a common theme in discussions of the future of the Australian economy. The absence here of a recommendation to push for closer links with Asia is due to the belief that the groups we need to meet from Asia and with whom we must establish links are also pushing into the US and Europe. We will meet on common US or European soil and in the longer-term, if we are successful, a common time zone and geography will bring us closer together.

The image and structure of our technological community.

Two further issues I would like to address concern the image and structure of Australia's technological community.

Across the world the last decade has seen an enormous growth in the popularisation of science. This is appropriate in an economy that actually produces a major fraction of its wealth

from science. In Australia, however, science returns only a small number of jobs and generates only a small fraction of our wealth, and yet its population is repeatedly presented with subtle scientific concepts reduced to the arguments of a 9 year old. This leaves the popular viewer and thus voter, thinking that if they bothered to listen they would have easily comprehended most of what science is about. I propose that this devalues the once mystical and powerful message that was part of the scientific image presented to earlier generations. Although well intentioned, the popularisation of science has in my opinion 'dumbed down' science in the eyes of the community and thus in the eyes of the best students, who now reasonably think that a career in the financial services sector ranks equally with medicine and law and that careers in technology are second class.

A further concern is the current silence on the value of the complementary services required for a functioning technological economy. A visit to the Grand Place in Brussels reveals the power in the 14th Century Europe of the Artisans Guilds. For the last twenty years in Australia, the skilled technicians, tradesmen and support professionals have been subsumed as part of our university system. Despite the platitude that you get four times the remuneration as a plumber than you do as a PhD on a postdoctoral appointment, the message being sent to the early-stage students is that everyone must aspire to a university education, an education which I believe has not yet determined how to cope with the full range of skills required by our society. This has again devalued both the output of the universities attempting to offer qualifications in areas previously offered by technical colleges, and the quality of the courses that are seen by the businesses wanting to hire the graduates as being too academic and not related to industry needs.

Recommendation no 3. *Review the images beings presented to society of the scientific and technological world. Encourage government- funded dissemination of science to promote plain speaking descriptions of science without the emphasis on 'dumbing down' the message to make it presentable. Grow an appreciation of the importance of the technical and support groups in the*

Science & Technology community and provide a high status conduit for their training.

Conclusion

Over the past ten years the Australian Science and Technology community has made major progress on the management of intellectual property. This progress has not been matched by an appreciation of some of the other fundamentals. In particular, we must recognise that we will never be able to follow the US and European models. We lack the military-industrial complex that drives these technological societies and, for that reason, we must focus our efforts on forming international networks to encourage Australia students and scientists to gain international experience. Without this, the opportunities promised by the initial flowering of Australian IP will remain unrealised, the risks of failure will be minimised because we will never be players and the rewards will be limited to government grants.

Footnotes

¹Bruce Cornell serves on the NSW Innovation Council.

²The move to larger populations first sees a primary cultural motive displaced by an economic motive and an economic motive by a strategic motive. Only one of the models has been proven untenable and that is a cultural justification for science and technology supported by a strategic motive. With the collapse of the USSR, a strong case was made for the close alliance of the economic and strategic motives.
