Submission to Productivity Commission, August 2025

Comments on the interim report

"Growth mindset: how to boost Australia's productivity"

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Summary

This submission represents my personal opinions based on my engineering research and practice career since the 1970s. While I am a member of Engineers Australia, and Emeritus Professor at The University of Western Australia, this submission does not represent the views of either organisation.

This submission provides comments on the interim report *Growth mindset: how to boost Australia's productivity.* In this summary, I also briefly reference comments that I have made on the five pillar reports.

A vision of Australia's future could greatly strengthen this report. I suggest that, in addition to mining, agriculture, professional services and education, Australia could be positioning itself as a leading supplier of solutions enabling Asian societies with huge populations to be more sustainable and provide more effective ways to enable people with diverse abilities to fully participate in society. Examples could include special plant varieties providing nutrition supplements, or the personal air-conditioners that my company and I have commercialized recently. Australia might make these products, or partner with manufacturers in other countries.

Engineers have hardly been mentioned in Productivity Commission reports over the last few decades. Yet it is engineers that deliver solutions enabling people to be

productive, achieving more with less effort, time, materials, energy, health risks, environmental disturbances and uncertainty. Large sectors of our economy depend on engineers and engineering for their success.

I have suggested ways for Australia to improve engineering performances because engineering greatly influences productivity. I have addressed this in more detail in a separate submission commenting on the report *Building a skilled and adaptable workforce*.

Engineers are also key actors shaping the future of Australia.

Long term sustainability depends on engineers delivering solutions that use a lot less energy and materials. Engineers are key actors shaping productivity and sustainability in Australia and other countries and deserve more attention from government and the Productivity Commission.

Australia could significantly strengthen its ability to create commercially successful innovations, both engineering innovations and in other fields. The main sections of this submission present a case to adjust the spending criteria for the R&D Tax Incentive Scheme to achieve this, based on my commercialization experiences. I have provided details of our commercialization experiences to explain why commercially successful innovation relies on a balanced investment in technical R&D, market research and development, and trial manufacturing and sales campaigns.

Australia has world leading capabilities in robotics and artificial intelligence. In my comments on the reports *Delivering quality care more efficiently* and *Harnessing data and digital technology* I point out the opportunity to develop a large range of intelligent devices that extend human capabilities. These devices would enable more people with diverse abilities, including the elderly, to participate more fully in our society, significantly reducing the need for carers and assistance. With large aging Asian populations, there are rapidly growing markets for these innovations in our region.

The report *Investing in cheaper, cleaner energy and the net zero transformation* could be strengthened by addressing the potential for innovations that reduce the need for energy, reducing emissions at negative cost. I describe innovations and relatively old technologies that can do this. I my comments on that report, I also explain how distortions introduced into the Australian appliance market by commercial interests have blinded us to these opportunities.

Finally, I have provided comments on the report *Creating a more dynamic and resilient economy*. That report could be strengthened by acknowledging structural rigidities we have created in our economy today that have led to the perception of a *Cost of Living Crisis* often reiterated in popular media. I have also argued the need for greater resilience to different kinds of external shocks – economic, climatic, geopolitical, and social.

CONTENTS

1 Background knowledge

In making this submission, I will draw on 25 years of research on engineering practices, five decades of personal experience practicing engineering, 18 years developing sheep shearing robots, 10 years developing the first practical demonstrations of the Internet of Things, and 18 years commercializing an air-conditioning innovation with global markets. Some of the research findings provide insights beyond engineering.[1]

2 Imagining the future

The core report, *Growth mindset: how to boost Australia's productivity*, could deliver a much stronger message with a clear vision for Australia's future, especially for our economic future. While there are many sound recommendations and suggestions, a

[1] My submission commenting on the interim report *Building an adaptable workforce* {Trevelyan, 2025 #2292, pp5-7} has more details on my background knowledge.

well thought-out vision of the future would help lift readers' time horizons from the short-term future dominating current discussions in the media. It would also help to counter any criticism that this and the five pillar reports are simply tinkering at the edges for small gains.

In my opinion, governments should not be dictating the future. However, it is the role of government to try and create an environment for private enterprise to flourish and provide solutions that we will surely need in the years ahead.

Here are my suggestions for a future vision, looking 20 years ahead to 2045.

By 2045, Australia could be a world leader in climate resilience with a strong economy serving the huge populations living in our neighbourhood. Mining, education, professional services and agriculture will still be our major industries, but sustainable solutions serving the emerging needs of Asian populations will be emerging as a further strength, gradually replacing petroleum and gas exports.

Global temperature increases well beyond the Paris 2015 1.5°C limit are now locked in because there is no sign that global CO_2 emissions are sharply decreasing as recommended. Therefore, we need to plan for global temperature rises of 2.5°C or more. Therefore, it makes sense to plan our future around that reality and address relevant productivity issues. Failing to prepare now will cost us large opportunities in future.

We may be hosting significant refugee populations from the Pacific and even our own neighbouring countries. Ultimately, perhaps as many as 10 – 20 million people will be accommodated in Australia as a result of rising sea levels. This will significantly strengthen our economy, but this scenario will also test our ability to manage our landscape in a drying climate with retreating shorelines.

We live in a neighbourhood with around half the world's population within a few hours flying time. There are huge markets increasingly desperate for solutions that we can create here in Australia, solutions that provide goods for people using far less resources and energy, and with far less environmental impact.

We can build on the our First Nations Peoples notion of "country". Country is more than landscape where people live: people are part of country, so what we do to country we do to ourselves. Instead of thinking about the environment as something separate from ourselves, we can learn to think of ourselves being part of country. Whatever we

discard or emit into the atmosphere or water we also ingest. We can see this with microplastics that enter our waterways from our clothes washers and end up in sea animals and plants, and eventually in our bodies as well.

These ideas have helped sustain our First Nations societies for longer than any others on this planet, and understanding them now will help us too.

Here in Australia, we can devise solutions that will help sustain humanity into the far distant future. This vision can help create a vibrant, prosperous, and importantly a sustainable future economy. We have vast spaces, rich mineral deposits, the largest collection of plant diversity on dry land, bright sunshine and wind to provide endless renewable energy. Above all, we have laid the foundations for an inclusive, well-educated society with a rich diversity of people that will readily accept future climate refugees.

As the interim report *Delivering quality care more efficiently* has pointed out, caring for people who need it will be an increasing component of our national economy. The interim report has advocated a more consistent national approach linking the NDIS and other care services listed in the report.

Bringing more care services into a consistent institutionalized framework also enables data collection on a large scale which could help identify opportunities for engineered products that can help improve the quality and productivity of caring services. It is my suggestion that the aim should go beyond care, to one where we support people of diverse abilities to have the opportunities to fully participate in society to the extent they wish to.

To achieve this, I advocate that we build on our national strengths in robotics and artificial intelligence research and development to develop products and techniques that can help improve productivity in the care economy, and support people to participate fully in their societies. I have addressed this in my submission on the relevant interim report. Most countries in our region are or will be experiencing a huge increase in the need for care in coming decades, especially for elderly people. Many more countries, particularly poorer countries, have vast populations of stunted children who will also require a lifetime of special care. Up to 45% of children in countries such as India, Pakistan, Bangladesh and countries in sub-Saharan Africa are facing this challenge.

Australia has unique capabilities and opportunities in this sector. I have suggested policy measures that could lay the foundations for large industries in future.

The national innovation ecosystem could be improved to increase the likelihood of commercially viable innovations in this sector, and that is the main agenda for this submission.

3 Stalled productivity growth: alternative explanations

There is wide agreement that future economic prosperity and social development in Australia depends on productivity improvement. After significant growth through the 20th century, productivity growth has slowed significantly, both in Australia and other countries of people

Economists have debated the underlying causes.[2] Advocates for productivity improvement in the business and finance communities and the Productivity Commission have argued strongly for lighter regulation and more flexibility to deploy labour more effectively.[3]

In the following paragraphs, I would like to suggest two additional explanations for stalling productivity growth:

- Fading appreciation of commercial realities and formal collaboration methods among engineers, and
- Weakening capacity to develop trusting collaborative relationships resulting from a preference for text communication over face to face interactions. This preference, in turn results from a combination of a hidden education curriculum and technology changes.

3.1 Fading knowledge on collaboration methods and finance among engineers

It is not widely appreciated that engineering activities strongly influence both productivity measures. Labour productivity measures the value of goods produced divided by the number of hours worked. Multi-factor productivity measures the value

[2] See for example (Manyika et al., 2015; Remes et al., 2018)

[3] Commission report "*Growth Mindset: how to boost Australia's productivity" 2025, (PC1)*

of goods produced divided by the value of capital, energy, materials, purchased components and labour needed to produce them.

Labour-saving devices, automation, energy-efficient plant, infrastructure, telecommunication systems all help to decrease the labour, energy, time and materials needed to produce goods, increasing labour and multi-factor productivity. Reducing uncertainty, health risks and environmental disturbances also reduce wasted investment and societal costs.

While engineering lies behind so many productivity gains in human history, there are further large potential performance improvements in engineering. Engineering projects and enterprises are not performing to their full potential. As a society we are sustaining huge avoidable costs.

Most engineering projects are costing more and taking longer than they should. Also, most engineers today weaker understanding about the financial implications of their work. Therefore, it is not surprising that we are seeing weaker productivity growth.[4]

While it does not amount to proof, there is circumstantial evidence that changes in the education of engineers lie behind these issues.

University engineering schools mainly teach the science of engineering, based on mathematics and foundation sciences such as physics, chemistry, biology etc. Engineers need several years of post-graduation workplace education, much of it informal, to learn how to practice engineering effectively. In particular, engineers need to learn how to enact large-scale collaborations that preserve the technical intentions when artefacts are first conceived. That can be challenging because, mostly, the people who deliver engineered artefacts may never even meet the engineers that conceived and designed them.

Until the late 1970s, most Australian engineers learned to practice engineering in public sector engineering organisations. Often, graduates complained that they were required to conform with seemingly arbitrary bureaucratic procedures involving vast amounts of "paperwork". Most never realised that they were learning large-scale collaboration methods such as how to write technical specifications and contract documents. Also, since public sector organisations seldom had lavish funding, young engineers learned

[4] {Trevelyan, 2025 #2292, pp 40-43}

how to arrive at the most economic solutions possible, often using whatever materials happened to be available. Engineers had to learn the financial implications of their work, and their status was often determined by the financial scale of the work for which they were responsible, even if simply laying drainage pipes and footpaths in new housing estates.

As more engineering work was progressively outsourced to the private sector from the 1980s onwards, private firms could recruit the best of the experienced "job-ready" engineers from the public sector pool. These engineers brought with them their knowledge of engineering collaboration methods learned in the public sector, and refined for private sector firms. Naturally, private sector firms were more productive than the public sector engineering organisations which were also providing training to young engineers who made mistakes, part of the learning process.

By the end of the 20th century, the public sector engineering organisations had either vanished, been privatized, or had their engineering head count reduced to the bare minimum. Practically all engineering work was subcontracted to private sector firms.

By 2015, the last of the cohorts of public-sector engineers had reached retirement age. Their knowledge of formal collaboration methods and their ingenuity enabling cost-effective solutions originally learned in the public sector have vanished.[5]

As explained in my accompanying submission, we are now facing appalling project delivery performances and huge avoidable costs in engineering projects, and collaboration weaknesses are one of the leading causes.[6] Contrast this with [REDACTED] controversial Coolgardie Goldfields Water Supply Scheme which was completed only a year later than scheduled in 1902 with a cost overrun of only 8%, without any accurate maps when the project was planned.[7] Few engineering projects can claim that kind of performance today.

3.2 Effects of the hidden curriculum

A combination of the hidden curriculum in formal education, coupled with technological changes influencing the ways people collaborate at work may have

[5] Engineers today have a relatively weak understanding of finance and little if any understanding of what economists refer to as productivity {Trevelyan, 2025 #2292, pp 40-43}.
[6] {Trevelyan, 2025 #2292, pp 8-11}
[7] {Evans, 2001 #309;O'Connor, 1896 #1291}

undermined the ability to form and maintain trusting relationships on which effective collaboration depends. This phenomenon affects engineers, and may also affect many other occupations.

The hidden curriculum in education consists of learning from practices which are not articulated formally or explained.

Briefly, formal education rewards students with individual grades. On receiving grades most students experience intense positive emotions of elation (if grades are higher than expected) or relief (if grades are not as bad as feared). To earn grades, students mostly type assignments on a computer or write answers in an examination hall. Therefore, there is a repeated Pavlovian conditioning reinforcing an association between writing and earning value or esteem. In the workplace, we see evidence from qualitative studies on engineers that engineers associate solitary writing performances with value generation.[8] Text messages take priority over face to face communication: text communication is fast free and easy thanks to the new technologies that appeared in the 1990s – 2000s.[9] Yet text communication and remote virtual meetings are inefficient and do not build trust as easily as face to face meetings.[10]

In other words, formal education encourages students to develop work habits that undermine collaboration. These habits manifest themselves as a tendency to value text communication over face to face social interactions since technological changes made text communication so easy in the early 2000s. It is conceivable that these changes have led to the observation that so many workplaces exhibit toxic working cultures[11] and deterioration in the ability of young people to form collaborative social relationships.[12]

As productivity depends on collaboration, weakening collaboration capabilities could well drive weaker productivity growth because the effects are so pervasive across all occupations.

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[8] For example, the motto of the University of Western Australia's engineering student society is "non loqui sed facere" which literally translates as "people who don't talk but make things". See also {Perlow, 1997 #347}.

[9] Before the 1990s, text communication was slow, costly and replies took weeks to arrive, if ever. Despite the intrinsic preference for written communication, resorting to face to face meetings or telephone calls was the only way to get things moving on an engineering project.

[10] {Norman, 2019 #1866}{Trevelyan, 2019 #1876}

[11] {Pfeffer, 2015 #1643}

[12] {Turkle, 2017 #1579}

3.3 Improving engineering performances for productivity growth

We could restore our lost capacity for post-graduation learning in engineering, and at the same time build on new insights into effective engineering practices emerging from recent research.[13]

In a separate submission, I have argued for policy changes to provide engineering firms with incentives to invest significantly in post-graduation workplace education, building on recent research.[14]

I leave it to other researchers to propose measures for non-engineering occupations.

4 Reinvigorating our innovation ecosystem

There are many other opportunities for creating a more dynamic economy. The Commission report points to smaller gains from technology and its diffusion.[15] The engineering issues discussed above might account for this, in part. It is likely that if engineers knew as much about generating commercial value from their work as they do about the material properties of concrete that Australian firms could be more entrepreneurial and commercially successful.

Our technological innovation system could also be improved. Later in this submission, I have argued for certain marketing and other crucial non-technical activities to be included as eligible expenditure under the R&D Tax Incentive Scheme. I have drawn on my experience commercializing an air-conditioning innovation to show why firms need to be supported for these activities to increase the probability that innovations will be commercially successful and hence diffused into the national economy. This experience also provides an example of a product that will provide affordable and sustainable cooling for billions of people within foreseeable renewable energy resources: a critical need in a warming global climate. This is an example of the kinds of sustainable

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[13] Almost nothing was known about what engineers really did in their work in 2005 {Barley, 2005 #611}. Even today, there are still only around 300 research publications that can help build some understanding, a tiny collection compared even with fields like engineering education (focusing almost entirely on undergraduate studies) where 5,000 or more papers appear annually. Even though there are few research papers, there are already valuable insights that firms can build on.

[14] {Trevelyan, 2025 #2292}

[15] Commission report "*Growth Mindset: how to boost Australia's productivity*" 2025, (PC1, p9)

solutions that Australians can help develop for the huge populations in our region of the planet.

Our relatively narrow economic base and reliance on primary industries – agriculture and mining – constrain opportunities for national productivity improvements. We have an extraordinary opportunity to benefit from our geographic location, in the same region as the largest concentrations of people on the planet. Our nearest neighbour, Indonesia, has a similar population to the USA and offers immense market opportunities. Across southern Asia, there are nearly three billion people, similar to the combined populations of China, Europe and North America. However, we have singularly isolated ourselves from these opportunities by allowing our innovation sector to focus almost exclusively on information technology, an industry in which most of our neighbours also excel and compete. We have chosen to ignore much greater opportunities by offering physical products that meet the needs of huge nearby populations. However we need improved performance by Australian engineers to take advantage of these opportunities.

One of the best known ways to boost future Australian productivity is to encourage commercially successful innovations, especially innovations that also boost global sustainability.[16] Presently, there is a critical shortage of commercially viable products and services that reduce the global footprint needed to sustain human civilization.[17] With a highly educated population and creative innovation ecosystem, Australia is well placed to meet this demand because we are located close to the world's largest populations and share similar climates.

The R&D Tax Incentive Scheme (RDTIS) has encouraged the development of many innovative technologies in Australia. However, R&D spending in Australia is well below the OECD average. Many past submissions to government have proposed ways to increase R&D spending by Australian firms. However, the resulting changes to RDTIS have not resulted in significantly increased spending.

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[16] I use this term to describe the means by which we ensure that future generations of people on Earth have the same or preferably better opportunities as our generation.

[17] Murray, S. (2024, October 3). Can transition finance get us to a greener future? *Financial Times*. https://www.ft.com/content/f2a6149f-4bdc-43c3-80ae-c9d46b9b4486

One of the best ways to achieve greater spending by firms is to increase the probability of commercially successful outcomes from RDTIS. A higher rate of commercial success will motivate more firms to invest in innovations.

4.1 Widening RDTIS spending categories

In the rest of this submission, I argue that the RDTIS scope needs to be widened to maximize the probability of commercially successful outcomes. Currently RDTIS only supports scientific and technological developments. All other aspects of commercialization are regarded as "commercial" and spending on these aspects is excluded from the scope. However, successful commercialization almost always requires investments in market research, marketing assets, IP protection, sales channel development and trial sales campaigns.

Our commercialization story serves as an example to explain why these "commercial" aspects should be included in RDTIS. I shall cite another innovation as an additional example to strengthen this argument.

In my company, we have commercialized an invention that can provide personal cooling for billions of people exposed to hot climates with a tiny environmental footprint compared with traditional cooling technologies such as room air-conditioning. This is an increasing need with climate warming and urbanization creating hotter living conditions. I shall draw on this example to show how the innovation ecosystem in Australia could be significantly strengthened, particularly for developing innovations that can boost global sustainability.

Our commercialization has relied on a balanced investment in technical research and development, market research, production, marketing, IP protection, and development of sales channels. As a small startup developing a product with global potential, we have spent considerably more on these "commercial" aspects than technical research and development. Fortunately, we have had access to patient family investment capital, without which this commercial development would not have been possible.

The core criteria for R&D activities today are:

- Experimental activities whose outcome cannot be known in advance;
- Following a systematic progression from hypothesis to experiment, observation, and evaluation; and

- Conducted for the purpose of creating new knowledge.

The entire process of commercializing an innovative product or service usually satisfies these criteria. One cannot know in advance whether a conceptually new idea for a product or service will be commercially successful. At the start, social research, focus groups, interviews and surveys are needed to evaluate the potential addressable market. Technical research and development is needed to create a minimum viable product, of course. However, even if the market is assured and the product or service provides expected benefits, one cannot know whether people will actually appreciate the value proposition and buy at the predicted price point until it is available in the market. Even if people buy the product, as we have found, one cannot be at all confident about raising investment capital to scale up production and sales. Since provisional patents must be secured before public product sales, IP protection has to be included as part of the commercialization cost, even before one can be assured of sales.

The fact that spending on most of these activities is excluded from RDTIS sends a powerful message: don't engage in marketing, production or sales until the technical research and development is completed.

4.2 A tragic outcome from the current system

This leads to some tragic outcomes, such as one I have seen recently. A small Australian startup firm has spent millions on patenting a low cost, long lasting solar water heating innovation in a large number of countries. Yet the firm has not identified a compelling value proposition, nor do they have a clear idea on who would actually buy the product. The firm does not even have prototypes to demonstrate the benefits to potential buyers. A later section (12) has more detail on this case study.

4.3 Need for early stage market research

If Australia wants to see a greater proportion of technological innovations progressing to commercial success, then fundamental market-related questions need to be answered early in the development. Important questions such as "who might buy this?" and "how much would they pay?" and "how many people are likely to buy this?" need to be answered before committing to expensive product development and patent protection.

With the current RDTIS, I can spend millions on technology research and development, yet I can only apply for a mere $20,000 to $30,000 for an export market study. The lack of government support for market research and marketing asset development has created a overwhelming imbalance: current government assistance programmes for innovation allocate only 0.4% to marketing and little if any to other "commercial activities".

When I have raised this issue with Department of Industry advisers, the response has been "well, that is something that private sector firms can do very well: there is no need for government assistance."

There are two false assumptions in this response. First, that small firms have financial resources to employ established firms, and second that these established firms can fulfil the marketing functions needed by technology startups.

4.4 Experiences with marketing firms

Our experiences with some of the best marketing firms in Australia and other countries has shown that established firms cannot adequately fulfil many marketing functions required for completely new products. Developing our own in-house capacity has been essential. Established marketing firms are good at promoting established brands. However, we have found that their capacity to develop marketing assets and run effective advertising campaigns for conceptually new products has been far inferior to our own in-house staff.

While successful marketing will normally require in-house staff, patent protection has to be secured by expert firms. I have seen several Australian innovations losing market share because their developers chose second-rate patent attorneys as a cost-saving measure.

4.5 Expense criteria

Therefore, I argue that government support needs to include any aspect of innovative product or service commercialization that satisfies the three criteria listed above that currently apply to technical research and development.

However, expanding the RDTIS scope cannot be an open invitation to spend.

Apart from satisfying the three essential criteria, spending on each commercialization aspect must be justifiable in relation to the other aspects. In our case, we have created a technologically simple product, so spending on technical research and development has been modest. The product is appropriate for very large markets in south Asia and elsewhere, as well as many developed country markets. With a very large addressable market, spending on market research, marketing assets, developing sales channels and trial sales campaigns has been far greater in proportion.

As a counter-example, a costly guidance system for an underwater robot to be used for monitoring and mapping endangered coral reefs might require millions in technical research and development. However, the addressable market is relatively small, so far less needs to be spent on market research and sales channel development.

In other words, eligible spending must be justified in terms of the three established criteria: outcomes that cannot be known in advance, a systematic data gathering and evaluation process, and the development of new knowledge.

4.6 Rebalancing to favour sustainable innovation

The current system of government support and the investment environment strongly favour technical research and development in IT software investment and financial services with no particular contribution to planetary sustainability. That's partly because it is easier to satisfy increasingly tightly defined rules for documentation and justifying the purpose of research and development.

Innovating new physical products (like ours) faces significant resistance from investors who see the long development timescale and the complications of distributing a physical product as significant deterrents. However, it is mostly physical products with much greater energy efficiency and material economy and reusability that are needed to reduce humanity's environmental footprint.

It makes sense to rebalance investment into sectors which can provide commercially viable products that improve sustainability. These products are increasing in value for the people in our region.

One way to encourage this is to increase the proportion of spending that can be reimbursed under RDTIS where large potential environmental footprint reductions can be demonstrated.

Another key to success in meeting the demand for products and services that improve global and regional sustainability is market awareness. For example, while millions of Australians travel to Bali for holidays, very few travel to other parts of our nearest neighbour, Indonesia, where they might contribute to understanding the needs of most Indonesian people.

Government policy settings could encourage experienced innovators to spend time away from Australia, but still in our immediate region. The Reverse Columbo Plan could be strengthened in ways that would encourage successful Australian innovators to work with commercial enterprises in the region.

4.7 Policy suggestion summary

In order to increase the probability that innovations supported by the RDTIS will be commercially successful, the scope of claimable expenditure under the scheme should include any activity satisfying the three principal criteria: outcomes that cannot be known in advance, a systematic data gathering and evaluation process, and the development of new knowledge.

1. Claimable spending should include marketing R&D, including market research studies, development of marketing assets such as websites and videos, and development of in-house marketing expertise and capacity. Strengthening marketing would significantly increase the likelihood of commercial success for innovations supported by the scheme, and hence increase downstream tax revenues. Effective patent protection also increases the likelihood of capturing downstream revenue from innovative products.
2. Increase the payout from the RDTIS based on a factor calculated from the potential total global environmental footprint reduction that could be achieved by developing a particular innovation.
3. Increase support for the Reverse Columbo Plan and learning of southern Asian cultures and languages to promote extended stays by young Australians in the southern Asian region, and also visits by experienced Australian innovators.

5 Coolzy – a sustainable innovation case study

My company has invented a low-cost and extremely energy-efficient air-conditioning solution, Coolzy. Coolzys can provide air-conditioned comfort for everyone on the

planet forced to live in hot climates, without requiring substantial additional energy production. The only other alternative, conventional space air-conditioning is both unaffordable and unsustainable on such a scale. IPCC forecasts suggest that growth in demand for conventional air-conditioning could increase global emissions by 13% by 2100. That's why new technologies such as Coolzy are essential.

Currently, we manufacture Coolzys in China, though we are negotiating with manufacturers in other countries to diversify our supply chain.

In this submission, I will describe the recent invention we have commercialized. The only reason this invention has succeeded is because it builds on all our intrinsic advantages. This opportunity started with our multicultural society, family connections that extend to the largest population concentrations on the planet. Yet, our innovation eco-system is poorly positioned to take up similar opportunities.

Government policy changes have significant potential to overcome the barriers we have faced in developing our global commercial venture. Later in this submission I shall explain how this might be done.

5.1 How the idea emerged: first hand exposure to extreme heat

This innovation came about because my wife,[REDACTED], was born in Pakistan. We met in Perth in 1992 where she has settled after arriving in Australia in the late 1970s.

Visiting her family exposed me to the need for cost-effective cooling. Summer indoor night-time temperatures exceed 40 °C and humidity levels exceed 60% regularly. Conventional room air-conditioners are ill-suited to buildings with no insulation and permeable structures to promote natural ventilation. The summer running cost is AUD 150 – 200 a month, just for a bedroom. Average family earnings are AUD 400 – 500 monthly.

Coolzy reduces the electricity cost for night cooling by up to 95%, according to some of our users in Pakistan.

Coolzy is a very simple idea: a tiny refrigerator with a fan inside blowing cool air to the faces and upper body of one or more nearby people. Achieving the targeted air flow with minimal mixing with the surrounding room air required years of patient technology development, leading to several patents. Videos here and our website provide more explanations. A bed tent concentrates cooling for the most extreme heat,

from 27°C to 40°C. We designed this product for Pakistan: while daytime outdoor temperatures reach 50°C, night temperatures in buildings are typically 35°C - 40°C.

However, Pakistan is a very challenging market for newcomers, even with extensive well-placed family connections. Therefore, we have pursued other markets to build financial strength in the company. Australia is currently our largest market. The USA is set to surpass Australia soon. Indonesia is promising, but we are currently facing challenges in getting our own company operation established without a strong local partner.

5.2 What is a Coolzy?

Coolzy is a tiny compressor-driven fridge with a fan inside that focuses cool air on people who need cooling. It drastically reduces the space cooling energy requirement by concentrating cooling where it is needed: directly on people. Bricks and concrete don't need cooling.

Coolzy technology has been commercialized by our Close Comfort start-up company in Perth, Western Australia. Coolzys have been in the Pakistan market since 2016 and are now sold in about 30 other countries, including Indonesia, another developing country market.

Coolzy is a simple and easily portable appliance. No installation or building modification is required.

Coolzy reduces the energy required for sleeping in air-conditioned comfort to as low as 100 – 200 Watts per person, compared with 600 – 1200 Watts per person with traditional room air-conditioning.

For indoor temperatures above 27 °C, a specially designed bed tent is recommended. It retains cool air over the bed, providing up to 15° apparent temperature reduction. This combination exceeds the comfort level provided by a typical 1.5 ton conventional split air-conditioner in a small bedroom with an overhead ceiling fan running.

Each Coolzy uses a tiny quantity (~ 100 grams) of low-cost, climate-friendly hydrocarbon R290 refrigerant in a permanently welded refrigeration circuit. The power consumption is nominally 340 Watts and the cooling output up to 1100 Watts at 33 °C, 80% relative humidity.

Because Coolzy uses so little energy, it is readily affordable for low-income families. While conventional air-conditioning is attractive for the urban elites, Coolzy's low running and acquisition cost enables healthy air-conditioned sleep and comfort at work for almost all urban and rural workers. Over time, this would significantly boost productivity and social equity.

Close Comfort needs external finance to scale up for large developing country markets.

Mass manufactured Coolzy units would cost about USD 80 each to manufacture. Coolzys are currently manufactured in small batches of 300 – 2,500 units in a Taiwanese-owned factory in southern China. Because the batch size is small, the current production cost is much higher. Bed tents currently cost about USD 30 in small batches. More economical designs would permit mass production of tents at a cost of USD 12 – 15.

Illustrations in following pages help to explain how a Coolzy works.

At 200 Watts per person, Coolzys could provide comfortable sleep for the entire 200 million population living in on the hot plains across Pakistan with 40 GW electricity, about 80% of Pakistan's current grid capacity. Within 20 years, we can be confident that affordable solar/battery systems will provide most of the energy needed. Most residential buildings in Pakistan have the roof area to harvest sufficient solar electricity to run Coolzys and other essential household electrical appliances for the occupants.

Coolzy was designed specifically for Pakistan. The first product launch in 2016 was an outstanding success with about 1,000 units sold in the first six weeks with only a tiny advertising budget. The selling price for the basic model unit with a bed tent was equivalent to USD 290. Most units were sold online through daraz.pk, the local equivalent of Amazon. About 10% were sold through an up-market department store chain.

This proved that the product was extremely attractive in the Pakistan market.

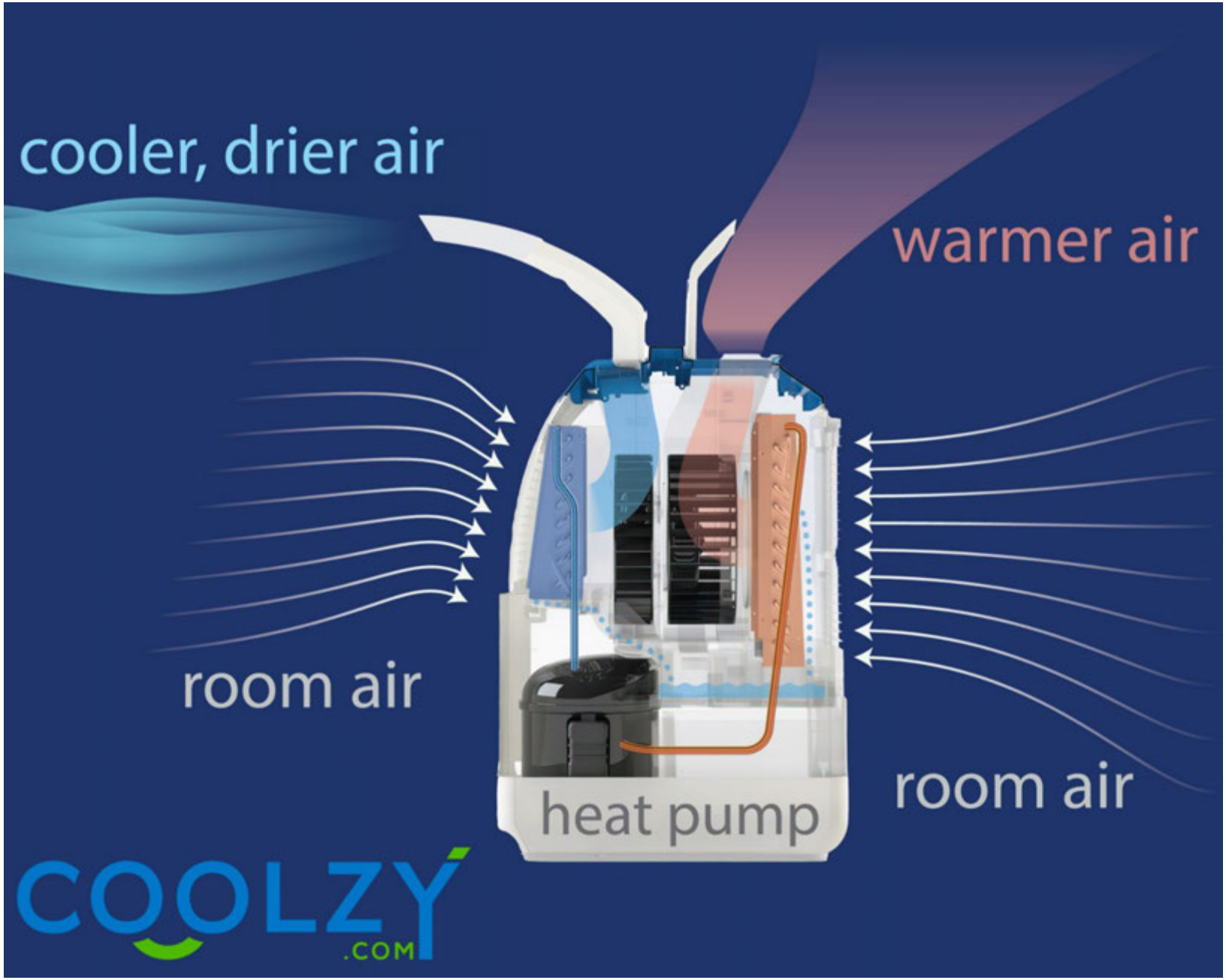
Unfortunately, Pakistan's economic situation forced the government to introduce tight foreign exchange controls which limited opportunities to import more stock and grow sales. Recently, conditions have improved, and Close Comfort is reactivating Pakistan imports and sales from early 2025. The recommended retail price has been held close to the original price of USD 290.

In 2021, Coolzy replaced the original Close Comfort branding: the name connotes the product function and does not need translating into local languages. Coolzy now has a high degree of brand recognition across Pakistan for a tiny startup company.

In the years since 2016, the company has expanded sales into many other countries, gradually refining promotional messaging and building a large marketing asset base in a variety of languages. The focus has been on aligning customer expectations with the product performance, leading to very positive reviews in all markets. The customer learning journey includes building an understanding that it is not necessary to cool an entire room to feel comfortable.

By paying close attention to this learning journey and the different stages customers pass through, from awareness, to curiosity, to learning about the product and then to the purchase decision, the company has managed to reduce product return rates from around 25% initially to about 5% today. Customer satisfaction has increased as a result. Both are necessary for the company to be profitable. The company achieved positive cash flow for the first time in June 2024.

The potential Pakistan market for Coolzys with bed tents is many times larger than the air-conditioning market today because it is far more affordable, especially with local mass production.


cooler, drier air
warmer air
room air
heat pump
room air
COOLZY
.COM

Coolzy: a tiny fridge with a fan, concentrated cooling where it counts

Coolzy runs on only 340 watts and provides 5 - 7 °C apparent cooling

Coolzy: quiet and perfect for healthy sleep

Coolzy creates a cool air blanket, apparent cooling is about 5 - 7 °C

Coolzy with Igloo Tent provides comfort equivalent to a split air-conditioner with indoor temperatures up to 40 °C with less than 200 Watts per person

Coolzy + Igloo tent: sleeping sanctuary on less than 200 Watts per person

5.3 Frequently Asked Questions about Coolzy

5.3.1 Is Coolzy similar to the portable air-conditioners I have seen before?

No. Coolzy delivers cool air in a completely different way using patented technology, achieving better comfort than conventional portables for a quarter or less electrical energy. Coolzy emits 5 – 10 times less noise, with an appliance about half the weight and size, with far less environmental impact.

5.3.2 Surely, Coolzy would cool a small room?

No: with only one quarter the cooling power of even the smallest conventional air-conditioners, Coolzy would not cool even a small room noticeably. Instead, Coolzy concentrates cooling where it counts, on the head and upper body of people using it, providing personal comfort with far less energy.

The Igloo bed tent is like a tiny room within a room. However, Coolzy only maintains a layer of cool air at the bottom of the tent where people sleep: it does not cool the entire tent.

5.3.3 Does Coolzy require water or ice?

No, Coolzy uses a tiny compressor-refrigeration heat pump, and needs no water, ice, or any other consumable. Think of a refrigerating fan: that's a close analogy.

5.3.4 Does the warm air heat the room?

Warm air rises to the ceiling where the heat is absorbed by the building structure, especially in South Asian homes where the ceiling is typically a reinforced concrete slab or a tiled roof on steel frames. In a small, well-insulated room, there will be a noticeable temperature rise. However there is no discernible warming effect for people exposed to the cool air flow. An optional exhaust pipe is available for people who want to be assured that the warm air is vented through a window or doorway.

6 Commercialization timeline

Here is a brief year-by-year account of our commercialization story and some of the lessons we learned along the way.

6.1 2004 – 2013

- Initial experience in Pakistan in 2004 leads to concept development and invention.
- Initial prototype testing by students, initial prototype design 2008.

- Testing for two years in different conditions.
- Redesign in 2012 for transportability.
- We succeeded in gaining an early commercialization grant which provided us with some R&D funding and an experienced insolvency accountant who knew the traps faced by startups. He taught us to lodge R&D Tex Incentive applications and some of the basics in marketing.
- First prototype taken to Pakistan in 2013, followed by informal market studies in Pakistan.
- First commercial prototype for customer evaluation commissioned in Melbourne 2013, and then at China factory.
- Commercial prototypes delivered to 20 customers in late 2014 and early 2015.
- In 2015, invested 175,000 in researching and developing new more efficient models.

6.2 Financial Year 2015-2016 (FY 2016)

Total investment so far: 1.3 million (investment amounts are approximate, and do not include investments in product inventory)

Revenue flow AUD 80,000.

We invested 100,000 in market research, video production and development of an e-commerce Shopify website. We invested about 180,000 in plastic injection moulds at China factory. We invested AUD 350,000 in stock for sale in Pakistan.

We invested $80,000 in research and development of new models for Australia. Many people had told us there was a market for our products at home and asked if they could buy a machine.

While initial sales in Pakistan were extremely encouraging, we learned to spend more on customer education to better align customer expectations with units delivered and reduce product return rates.

We formed a relationship with a Pakistan entrepreneur who promoted our technology to Haier in China. He optimistically thought he could sell the technology for USD 20,000,000 to the world's largest white goods manufacturer. However, when we visited their head office in Qingdao, the senior managers were under immense pressure as their annual sales had fallen by 20%. This was the first drop in sales in 20 years so they were not interested in examining new ideas at that time.

We approached local West Australian investors, including [REDACTED]. However, his investment advisor was not confident investing in a novel physical product for which the main markets were in India and Pakistan. His response: "We understand the markets for iron ore, orange juice and beef. We don't understand the Pakistan and Indian markets for air-conditioners."

6.3 FY 2017

Total investment so far: 1.9 million

Revenue AUD 38,000

We invested $150,000 in further R&D and development of new models for Australia and Pakistan. $35,000 invested in new moulds.

We invested in stock for sale in Australia, developed marketing assets for Australia including expanded e-commerce website. Invested in market research and sales pitch development. We hired two of the best marketing graduates from UWA having learned that traditional marketing firms were slow to understand our technology. We learned that Australian market has three attractive niches for us: renters, caravanners and eco-warriors.

We approached AusTrade to help with introductions to Singapore marketing agencies. However, we did not find an agency with capacity to develop education capacity for a new air-conditioning concept.

6.4 FY 2018

Total investment so far: 2.3 million

Revenue AUD 200,000

We invested 125,000 on heat exchanger R&D to improve thermal efficiency and reduce the quantity of warm air that carries away heat.

We invested AUD 250,000 in new stock for Pakistan and Australia. We participated in the BEX-Asia industry exhibition in Singapore and developed relationship with potential distributor. We learned that Indonesia is an attractive market and spent about 100,000 to develop a relationship with a local distributor (Navie) and we developed Indonesian marketing assets.

We approached a Perth company specializing in growth funding for startups through our family investment advisor. They prepared a business plan, drawing mainly on our own material, and charged USD 10,000 for approaching a US-based

investor. Through our own due diligence, we found that this investor had been convicted for fraud on several occasions and was now resident in Mexico. We located a former business associate in Salt Lake city who warned us not to pursue a relationship with him. We were lucky to contact a Tasmanian startup entrepreneur who had already paid USD 50,000 to seek an investment of 250,000 through this person with no result. We declined further contact with the Perth firm who were rather embarrassed at our findings.

6.5 FY 2019

Total investment so far: 2.7 million

Revenue AUD 180,000

We invested 120,000 on R&D to improve thermal efficiency in humid conditions and new quality control testing techniques. We invested in Singapore and Indonesia e-commerce websites with video assets, photographs, text, social media advertisements, Youtube advertisements, etc. We wasted 60,000 on one of the most prestigious Australian marketing agencies [18]and a further 30,000 on social media advertising which was stopped accidentally by the agency during the peak selling season. We learned that we have to develop our own in-house marketing expertise.

We were approached by a South African company interested in investing in our technology. Eventually we discovered that they were a front for channelling black money out of South Africa, so we had to decline further involvement.

6.6 FY 2020

Total investment so far: 3.8 million

Revenue 900,000

We invested 120,000 on developing air cleaning devices to fit to our air-conditioners, knowing that air pollution is a major issue in South Asian cities. We also invested in hiring a chief marketing officer with 180,000 salary. We spent 180,000 on developing new marketing assets to promote the Close Comfort brand. This included 120,000 to shoot a video at Marble Bar at temperatures up to 45°C to dispel any doubts among prospective customers that the product works. We invested 120,000 in research and development to reduced electric motor noise. At suggestion of Chief Marketing

[18] We approached 20 of Australia's leading marketing firms that seemed to have experience helping startups. Only one firm responded to our enquiries.

Officer, we wasted 110,000 on a branding campaign on SBS Video-on-demand at the wrong time of year (March).

6.7 FY 2021

Total investment so far: 4.6 million

Revenue 1,400,000

Invested 120,000 developing more effective air-cleaning and focusing devices.

Chief Marketing Office resigned after unsuccessful branding campaign and attempts to develop new relationships to grow sales in SE Asia. Continued technical research and development to reduce noise, increase thermodynamic efficiency and change to R290 refrigerant. We learned that willingness to engage with SE Asian distributors is essential.

6.8 FY 2022

Total investment so far: 5.7 million

Revenue 750,000, including unit sales to subsidiaries.

We invested 122,000 developing more effective air delivery nozzles and finding ways to stop water condensing on cold surfaces.

We recruited a Chief Operating Officer at 250,000 salary package with highly developed e-commerce and marketing skills. He created the Coolzy.com brand, and we invested in new marketing assets, including 400,000 in development of new multi-national e-commerce web sites with automatic translation into European languages, improved user manuals, videos, and photography to develop new Youtube and social media advertisements. In total, we invested about 900,000 in new marketing assets for the USA, Europe and Indonesia markets.

We successfully set up our own Indonesia operation without having to be in the country because we recruited a native speaker with engineering and logistics qualifications. She has navigated us through the complexities of registering an Indonesian business, enlisting members of her own family residing in Jakarta.

We invested 120,000 in development of new models for distribution in EU and USA and Indonesia.

We invested 120,000 on development of new quiet fans and nozzles.

We approached the Clean Energy Finance Corporation for investment funding. Initially, an enthusiastic staff member responded very favourably. Unfortunately, she left the corporation and her replacement was dismissive and, to be honest, rather rude and inconsiderate.

6.9 FY 2023

Total investment so far: 6.3 million (not including new stock)

Revenue 1,400,000

We invested 90,000 on refining new air delivery nozzles and collecting data to prove that they worked in representative conditions, also to develop new fan technology.

We decided to invest 3 million in new stock, and 400,000 in additional marketing assets for USA, Europe, being markets where higher retail prices will help build profitability.

We invested 120,000 in R&D on further development of nozzles, noise reduction, thermal efficiency improvements.

Overall, we invested 500,000 in marketing.

6.10 FY 2024

Total investment so far: 6.7 million

Revenue 2,200,000

We invested 90,000 on developing new fan designs and assessing sleep quality under high temperature conditions.

We learned that USA is a difficult market to compete on price, and American customers have limited education, and therefore take longer than in other countries to understand the product. We did not focus on a particular European city, preferring to invest effort in the USA market instead. The European summer was very cool, depressing sales.

We approached Export Finance Australia. They expressed strong interest as the company was within 12 months of being profitable. However, then they found that they were unable to invest in a primarily B2C (business to customer) company until two years of profitable sales had been demonstrated. They wanted firm orders from product distributors.

We sent printed letters to a dozen air-conditioning manufacturing companies in Japan, Korea, China and Australia suggesting a joint venture. None replied.

We approached AusTrade to help us approach air-conditioning manufacturers. There was no result. AusTrade is not equipped intellectually to help an appliance manufacturer.

6.11 FY 2025

After 10 months of negotiations, we finally secured a contract with BCF to range our products in major stores. Since 2018, we have only been in small niche retail stores in Australia. Australian sales grew well above expectations with strong sales through BCF. After a similarly long negotiation we will be in 67 BCF stores in the 2026 summer season, and also listed by Appliances Online. Intensive effort in developing associate marketing channels paid off in the USA with sales exceeding expectations by more than four times. Fortunately, with our decision to over-invest in inventory in FY2023, we had more than sufficient stock in USA our warehouse so we were unaffected by Donal Trump's China trade war.

Technical R&D continued on measuring unit performance in Indonesia and Pakistan, and building data on competing products.

We approached about 35 green investment funds in Australia and USA. Only three responded, all declining further interest as they were looking for software investment opportunities.

We were approached by a green investment company looking to place European funds. However, our complex company structure with 4 regional operating subsidiaries made the due diligence too hard for them to consider. We were also approached by the Australian Business Growth Fund, but they required a longer record of profitable sales.

We responded to a call for sustainable space cooling solutions by the International Finance Corporation with a strong proposal for investing in manufacturing Coolzy products in Pakistan. After 6 months we have heard nothing in response.

7 Summary of Learnings

1) Firsthand experience in each market is essential, to subjectively assess the performance of our products against competitors, assess how competitors are

serving the market and what the gaps are, and also to experience the commercial realities of the market.

2) We spend around 90,000 – 120,000 annually on technical research and development. We can claim 42% of the cost and receive this back about 12 months later.
3) We have found we need to spend 300,000 to 600,000 annually on development of new marketing assets. Most of this represents salaries of in-house staff. We have only been able to secure about $35,000 annually from EMDG grants for which we have to apply. We have not always been successful.
4) We have experienced advertising agencies in Australia, Indonesia, Singapore, Pakistan and Europe, and none have proved to be satisfactory. With a concept that is new in each market, the staff in advertising agencies have neither time nor motivation to truly understand our new concepts and products. Instead, we have had to train our own in-house experts.
5) We have found that outsourcing digital marketing expertise from local consultancies has been effective for the USA and Europe, but not for Asian markets.
6) From the launch of our first commercial product in 2016, it took 9 years to achieve profitability.
7) A patient source of capital (inventor's family investment company) has been critical for our success.
8) There are lots of unscrupulous companies preying on even well-advised startups like us, offering to raise finance, and even the best finance advisors can miss some tell-tale signs.

8 Government funding for innovation in Australia

I used perplexity.ai[19] to ascertain the approximate funding flows from government in the financial year 2024-25 to support innovation in Australia.

Industry growth programme	0.392	SMEs
R&D Tax Incentive	4.3	
EMDG	0.158	
AI Policies - safe and responsible AI	0.04	

[19] I do not have sufficient time (aside from my business priorities) to thoroughly check this data.
https://www.perplexity.ai/search/summarise-the-funding-availabl-XHEs.oKRSq2AQTF8DKYrlA#0
https://www.perplexity.ai/search/summarise-the-funding-availabl-XHEs.oKRSq2AQTF8DKYrlA#1
https://www.perplexity.ai/search/summarise-the-funding-availabl-XHEs.oKRSq2AQTF8DKYrlA#2

PsiQuantum	0.467	
Next Generation Landsat	0.449	
Renewable energy superpower	1.97	19.7 billion over 10 years
Future made in Australia	0.17	1.7 billion over 10 years
ARENA	1.5	
Sunshot	0.835	
Battery manufacture	0.549	
Sustainable finance markets	0.017	
Improving approvals process	0.182	
Workforce development	0.218	
Defence industries support	0.162	
Defence trade controls	0.028	
Future of industry and science	0.047	
Total	11.484	
EMDG by proportion	0.3%	

Spending by firms using the Australian R&D Tax Incentive Scheme was divided approximately 43% for IT-related innovations and 30% for physical product manufacturing, 11% for mining and 4 – 6% for agriculture and food innovations. Apparently, this split has been fairly stable for several years.[20]

Apparently, firms favour R&D for IT-related innovations because they perceive an earlier payback, and they think that documenting their R&D to qualify for the R&D Tax Incentive Scheme is intrinsically easier.[21]

Yet, IT-related expenditure is a much smaller proportion of the overall economy. For example, in firms producing physical products, material and component purchases form about 40 – 60% of a manufacturing firm's expenses, compared with about 1 – 5% on IT equipment and services, 20 – 30% on labour and 15-20% on overheads such as factory space.

So we can see from this brief analysis that Australian government support for IT-related innovation, especially when the investment in quantum computing is included, far exceeds support for manufacturing of physical products.

Support for marketing-related activities (EMGD) is about 0.4% of overall funding.

[20] https://www.perplexity.ai/search/using-the-most-recent-figures-IZwun2PvSsarAjS81iyj5A#1
[21] https://www.perplexity.ai/search/using-the-most-recent-figures-IZwun2PvSsarAjS81iyj5A#2

9 Policy suggestions

9.1 Rebalancing government support for innovation

The most obvious policy change would be to include the development or marketing assets in the R&D Tax Incentive scheme, with a factor that favours in-house asset development. For example, one could specify that firms can claim the cost of developing marketing assets such as websites, videos, photographs, market research studies, and pilot sales and marketing campaigns. As with R&D, firms could claim for the proportion of time spent by suitably qualified staff on marketing asset development. A discount factor of, say, 30% would apply to outsourced services to favour the development of in-house expertise. Similar documentation requirements would apply, for example, market-related hypotheses, evidence gathering, experimentation, and drawing conclusions.

While the initial outlays would add to the cost of the scheme, greater commercial success will generate tax revenue earlier, offsetting the early costs of enlarging the scope of the R&D Tax Incentive scheme.

9.2 Rebalancing in favour of regional sustainability innovations

There is a tendency in Australia to focus only on the sustainability of Australia, for example, by reducing CO_2 emissions from Australian firms and farms. This is a little naïve. We share a planet with billions of other people. If we are really interested in sustainability, we need to address the need for sustainable solutions for billions of people, rather than 25 million that happen to share our shores.

Policies that favour exploration of market needs in southern Asia, including climate zones that overlap Australia, have the potential to generate opportunities like Coolzy. How did the idea for Coolzy first emerge? The idea came from my personal experiences of heat and humidity in Pakistan, combined with electricity load shedding. That happened because I married a Pakistan-born woman here in Australia.

Enlarging schemes such as the Reverse Columbo Plan coupled with more emphasis on learning Asian languages and cultures in Australian schools and universities would see more young Australians experiencing life in southern Asia. Incentives favouring longer stays and visits by older Australian-based innovators would increase the chances of bringing more experienced innovators face to face with the need for clever ideas.

Additional R&D Tax Incentive funding for innovations that promote sustainability for large populations in south Asia would also help accelerate the development of products that improve regional and global sustainability. A simple way to do this would be a factor that increases the payout for firms developing such products depending on the overall potential reduction in the planetary footprint resulting from the innovation.

10Why do we manufacture in China?

Our products could be made in Australia.

The products are relatively compact so transport anywhere by ocean freight is relatively inexpensive. A single product configuration with minor variations suits all global markets. The mass market revenue potential is many billions of dollars annually. However, establishing a large manufacturing facility in Australia requires a currently unattainable degree of confidence among Australian investors. That is because our investors prefer bricks, rocks and apps . . .

Bricks represent property investment, particularly residential property.

Rocks represent mining investment. The blue chip majors are cash machines thanks to iron ore and China. That's not going to last. The rest provide a gambling casino where there are infrequent but large enough wins to encourage naïve investors to keep throwing in cash. And, we are very good at mining in Australia.

Apps represent software investments. Most investors have no clues about how apps work and what makes them successful so, like investing in small miners, it's another form of gambling which Australians love. An occasional win like Canva and Atlassian keep the punters hoping for another big one.

Even a casual content analysis of the pages of the Australian Financial Review reveals the extraordinary tilt of technological investment towards *apps*. The "tech" menu offers fintech, start-ups, social media, enterprise IT and technology reviews. The "companies" menu includes manufacturing, mining, professional services, energy, infrastructure and telecommunications.

The tech menu reveals how the meaning of the word *technology* has mutated from its dictionary meaning, the practical application of knowledge, especially engineering. Judging from the AFR coverage, and this is significant because it indicates *investor interests*, technology now refers only to information technology.

For example, coverage on 19th July 2025 included:

- TSMC, the chipmaker, has increased its demand forecast for chips serving AI developers;
- META investors settle a dispute with Mark Zuckerberg, the founder.
- A Singapore medical equipment manufacturer (*medtech* category) has acquired a 20% stake in an Australian medical equipment manufacturer.
- SquarePeg, a local VC funder has invested in a Silicon Valley AI venture.
- An opinion piece on the division between countries which are participating in AI development (ie countries with, or building power-hungry data centres) and those which are not.
- More opinion pieces feature ChatGPT, the possibility of AI boosting public sector productivity, and an investor's view of the longer term prospects for the cost savings from AI, a robot vacuum that picks up socks, and clip on ear buds.

In this discussion, there is not one article based on Australia's intrinsic advantages.

11 Australia's advantages

Australia has some unique natural advantages.

First, our location. Our nearest neighbour, Indonesia, has about the same population as the United States. A little further away, around 8 hours flying time, we have about half the world's population.

Second, our very successful multicultural society in which nearly everyone feels sufficiently safe and secure to get involved in activities beyond servicing basic needs: food, shelter, and financial security. We have family and business networks that link us intimately with the world's largest markets.

Third, we have high education standards across almost the entire population. Notwithstanding some problems with mathematics, my experience in many countries tells me that most of our people are better educated in a general sense than in other countries.

Fourth, and perhaps this is the most critical in the long term, our aboriginal people have developed ways of thinking and acting that have enabled a continuous living

culture for more than 60,000 years. Among us we have the answers that can enable global sustainability of human civilizations.

Fifth, we have relatively hot dry and humid climates similar to most people on this planet. Answers that work for us will work in many other countries.

Sixth, we are an English-speaking nation, the *lingua franca* of global commerce.

So, lets return to the AFR today and see what we can learn about our neighbours.

- Indonesia: nothing
- India: nothing
- Bangladesh: nothing
- China: nothing (except an opinion piece on the PM's visit dated the previously day)
- Japan: nothing
- Philippines: nothing

What's wrong with that? one might ask.

It's called putting your eggs in one basket, well, almost one.

AI might be intriguing. We have some very good people working on AI, and that's great. But from a national perspective, it is not something that builds on any of our intrinsic advantages.

12 Postponing market research: a cautionary tale

I advise a small startup developing new solar water heating technology. Their water heaters will last far longer than conventional solar hot water heaters and, in mass production, will cost less. The owner has spent millions on patent protection in 30 – 40 countries. He has relied on the R&D Tax Incentive to provide significant financial support for his research and development.

Unfortunately, the owner has not yet identified a compelling value proposition in any of the markets where he has taken out patent protection. Since market research is not included in allowable forms of R&D Tax Incentive spending, he has postponed marketing activities until he starts to export his products. While he would qualify for financial support under the Export Market Development Grant scheme, the available funding will be very small compared with his technical R&D spending, and marketing needs.

My preliminary analysis in Australia has highlighted some significant market resistance to such an innovation. While these new water heaters can be expected to last 40 – 50 years, few home owners can be confident of remaining in their homes that long to reap the benefits. It is hard to convince a buyer that the product will last that long without similar products that demonstrate such a long life. Furthermore, most homeowners don't choose their water heater: the choice is usually made by their plumber or builder who recommends a particular model as a replacement when a new one is needed. In the case of new homes, the choice of hot water heater is not a high priority for the new owners.

Therefore, it is hard to see a compelling value proposition in Australia, and the inventor has not figured out who their customers are likely to be.

South Asia has been considered to be a large market for these water heaters. However, foggy weather and high levels of particulate pollution greatly reduce solar radiation in the coldest months, and customers accustomed to gas hot water heaters prefer really hot water. These factors have been identified as reasons explaining why previous attempts to introduce solar hot water heaters in South Asia have failed. However, the Australian inventor was not aware of these issues before taking out costly patent protection that might, in the end, be too costly to defend effectively.