



**Professionals
Australia**

~ Submission ~

**Innovation Inquiry
Senate Economics
Reference Committee**

July 2014

Contents

About this submission	3
Innovation drives productivity and growth.....	4
Technology, science and engineering: the innovation enablers.....	5
Information technology – a big future	5
Scientists – the foundation of innovation in Australia.....	5
Engineering – bringing innovation to life	5
Australia has fallen behind.....	6
The demand for science and engineering professionals.....	7
Advertised internet vacancies.....	7
Where to from here – improving the situation?.....	8
Workforce development	8
STEM-based employment	8
STEM education.....	8
Acting to protect against deprofessionalisation	9
Maintaining in-house expertise	10
Informed purchasing	10
Impartial and expert policy advice	10
Broadening the skills base.....	11
Continuing professional development.....	11
Skills to encourage business acumen and greater commercialisation of research	11
Funding - investing strategically and sustainably.....	12
Public funding of science research.....	12
Funding levels.....	12
Reviewing the way research funding is secured	13
Investment in science and engineering research infrastructure	13
Business investment.....	13
Bringing industry and academia together.....	14
A roadmap to an innovative future.....	15
Summary of recommendations.....	16
Related documents	17

About this submission

A sustainable and vibrant engineering, science, technology and research workforce is critical to almost every aim we have as a nation.

As Australia moves toward 2020 improving Australia's science, engineering, technology and research capabilities will be critical to realising optimal levels of innovation, productivity and global competitiveness and in turn responding to the complex economic challenges we face.

As we transition to a knowledge-based economy – one which increasingly depends on the development and application of knowledge and technology – the relationship between technology, science, engineering and innovation and productivity growth will only strengthen.

Professionals Australia represents technology-based professionals in Australia, with coverage of engineers, scientists and information technology (IT) professionals nationally. We have a strong and vocal membership throughout Australia who provide a critical contribution to the innovation system from conception, through to development, commercialisation and practical delivery. Our members have a unique insight into how to maximise our innovative capability.

In this submission we propose a range of measures which we would encourage the Committee to examine, consider and endorse. Professionals Australia is strictly non-party political and has enjoyed a constructive working relationship with governments of all persuasions.

We encourage the Committee to take a similar approach and to consider seriously these important matters and frame a consensus position for adoption by this and future governments. Change, instability, politicisation and a lack of long-term vision have marked much public policy in this area.

Over recent years, Professionals Australia (formerly APESMA), has produced a range of policies as contributions to policy development in Australia. For the reference of the Committee, we have provided links to several publications which relate directly to your work in the "Related Documents" section of the Submission:

- **Realising an Innovation Economy (2012).** As the lead organisation in the Australian National Engineering Taskforce, we drove a range of practical public policy solutions for consideration by government. These were later considered by the Senate Inquiry "The shortage of engineering and related employment skills", who, like the AWPA, supported many of the recommendations.
- **Still the Clever Country? (2014) and Realising innovation through science and research and development (2014).** These are recent contributions to policy debate on research and development and science in Australia. The recommendations contained in the second of these publications standalone but are built on herein.

We would welcome the opportunity to appear before the Inquiry at a time and date of your choosing.

Yours sincerely



Chris Walton, CEO

Innovation drives productivity and growth

Innovation is a driver of both productivity and economic growth, as shown by the United States where half of the economic growth in the last 50 years can be attributed to scientific innovation¹, despite a decline in mining productivity.

It is but one of many other resource-rich countries around the world which have vastly better performances in innovation than Australia. Norway, dubbed “the world’s most northerly Arab country”² by its neighbours due to its oil riches, ranks 14 for global innovation as opposed to Australia’s 23rd on a weighted average of indices³, while it ranks first in prosperity leading Australia in fourth.

As a nation, we lag in producing new innovations – even against New Zealand where 20 per cent of firms produce product innovations that are new to international markets, while just 2.4 per cent of Australian firms do the same⁴.

Like the current Minister for Innovation, the Hon Ian Macfarlane, Professionals Australia recognises the importance of innovation to productivity, and the importance of our highly skilled workforce in fostering innovation.

In March 2014, the Minister authored an article titled ‘Australian productivity relies on innovation’⁵, in which he wrote:

“Productivity advances require innovative solutions to pressing challenges such as resource depletion and cost pressures related to rising energy costs.”

“For Australia to compete globally, technical solutions are essential to ensure we remain a high-skill, high-wage resource and energy producer.”

“Our international advantage is that our workforce is educated and adaptable”

The problem is that our desire to innovate, or to make the most of our resources, is lacking.

Following the 1990s productivity boom, which many attribute to a sharp upturn in the uptake of technological change⁶, Australia’s productivity growth has been lacklustre. Our “performance over the last decade” has “slipped”. “Our commodity boom and terms of trade boost have masked that performance”⁷.

¹ Chief Scientist (2013). *Science and the Economy*. <http://www.chiefscientist.gov.au/2012/03/science-and-the-economy/>.

² The Economist (2013). “Northern Lights”. Edition February 2 – 8 2013, p15.

³ Ibid.

⁴ S Eslake (2011). *Productivity: The Lost Decade*, p243. Reserve Bank, Canberra.

⁵ I Macfarlane (2014). *Australian Productivity relies on innovation*. CSIRO. <http://www.csiro.au/Portals/Publications/Magazines/resourceful/6-Australian-productivity.aspx>

⁶ R Gittins. *Productivity more about technology than reform*. www.rossgittins.com.

⁷ R Green, P Toner, R Agarwul (2012). *Understanding Australia’s Productivity Choice*, p8. McKell Institute, University of Technology, Sydney.

Technology, science and engineering: the innovation enablers

Information technology – a big future

Across our economy, information technology (IT) has been a significant driver of innovation and productivity. Economic consulting firm ACIL Tasman estimates suggest that for service industries, IT-related technology factors are responsible for 33 to 65 per cent of multi-factor productivity growth, and this figure increases to 45 to 75 per cent for the manufacturing industries.⁸

In the near future cloud computing, analytics and big data, broadband penetration, mobility and social applications are expected to drive further productivity improvement.

Scientists – the foundation of innovation in Australia

2012 figures from the Department of Industry, Innovation, Science, Research and Tertiary Education Science Research and Innovation Budget Tables show that the Australian Government invested around \$9 billion in 2012-13 through a suite of 79 programs across 14 portfolios.

While quantifying the contribution of science to productivity growth is problematic because it is, in the Chief Scientist's terms "interleaved" with many other sectors⁹, it is widely agreed that the most important way to meet the nation's emerging challenges is to develop our national STEM (science technology engineering mathematics) skills base.

This is set out by the Office of the Chief Scientist:

Productivity growth driven by innovation, including innovation based on STEM, offers significant benefits for the community.¹⁰

Engineering – bringing innovation to life

Engineering is the real-world delivery of scientifically-informed solutions to contemporary challenges and opportunities. While scientists provide the foundation for innovation, engineers bring innovation to life.

As our importation of engineering labour over many years should have taught us, engineers are highly educated global professionals, able to move to meet demand. With the departure of high-end manufacturing and the allied industries it enables, we also will see the departure of some of the most vital human capital we have.

We produce just one third of our engineering needs from domestic graduates each year, with overseas "the major part of overall growth in commencements"¹¹. "In an age of unprecedented globalisation and labour mobility"¹², Australia must improve its domestic supply of engineers, and to do this it must keep the critical pull factors delivered only by diverse industry, which in turn results in diverse employment outcomes and choice of specialisation from engineers.

⁸ Australian Workforce and Productivity Agency ICT Issues Paper (2013), p. 5

⁹ Australian Government, Office of the Chief Scientist (2013). Health of Australian Science, p. 22

¹⁰ Australian Government, Office of the Chief Scientist (2013). Science, Technology, Engineering and Mathematics in the National Interest: A Strategic Approach, p. 20

¹¹ Ibid.

¹² ANET (2012), *Realising an Innovation Economy*. ANET, Sydney.

Not only are engineers a global workforce, they function increasingly in work environments which are globalised. We face an internationally competitive environment for engineers. To keep a supply of engineers in Australia, we must look to maintaining industry in which they work and in building industries which provide competitive wages. Engineering is a diverse profession, with many specialisations – often governments do not take adequate account of the breadth of engineering expertise we have available in this country, nor account for their advice in program delivery. This has resulted in waste, poor policy and occasional tragedy.

Whilst engineers and the work they perform is of huge economic benefit to Australia across a wide range of industries, their work remains little known and little understood by many Australians. While every day we rely on the work of engineers in a range of societal settings, perceptions of engineers' remains rooted in infrastructure delivery. Research conducted by the Australian National Engineering Taskforce (ANET) amongst career guidance officers and students in 2012 found widely held misconceptions about the scope of the role of engineers in Australia¹³.

Australia has fallen behind

Governments throughout the years have variously re-cast and shaped our research and development and innovation sectors in an effort to improve our performance. This instability, change and confusion shows no sign of abating under the current government.

Our scientists are trapped in a never ending cycle of grant applications and our spending on research is at best mediocre, and poor if we exclude the resources sector. We import two-thirds of the engineers we need to run the country year-on-year¹⁴. We have vast reserves of renewable energy which we do not take full advantage of, and regardless of your position on climate change, this is at best wasteful, at worst neglect.

Yet given opportunity, certainty and assistance, Australia can and has innovated. In the 1990s, our take up of technological change was amongst the best in the world. We now sit in 22nd position.

While Australia spends “approximately 2.2 per cent of its GDP on research and development (R&D) - putting us just below the middle of the OECD table” – our performance when compared to innovation economies of Scandinavia, the US and Israel¹⁵ is poor.

The Chief Scientist has asserted that our spend as a proportion of Gross Domestic Product¹⁶ is declining, just at a time when the new Federal Government is bringing increased focus to the need to improve our productivity performance. This disconnect needs to be remedied.

¹³ Ibid.

¹⁴ Andre Kaspura (2013) *The Engineering Profession, A Statistical Overview*.

¹⁵ ABC Science (2011). *Australia's science budget 'uninspiring'*. <http://www.abc.net.au/science/articles/2011/05/11/3213833.htm>.

¹⁶ The Drum, ABC. *Research needs guarantees for long-term investment*. <http://www.abc.net.au/news/2013-08-13/schmidt-science-funding-election/4883800>

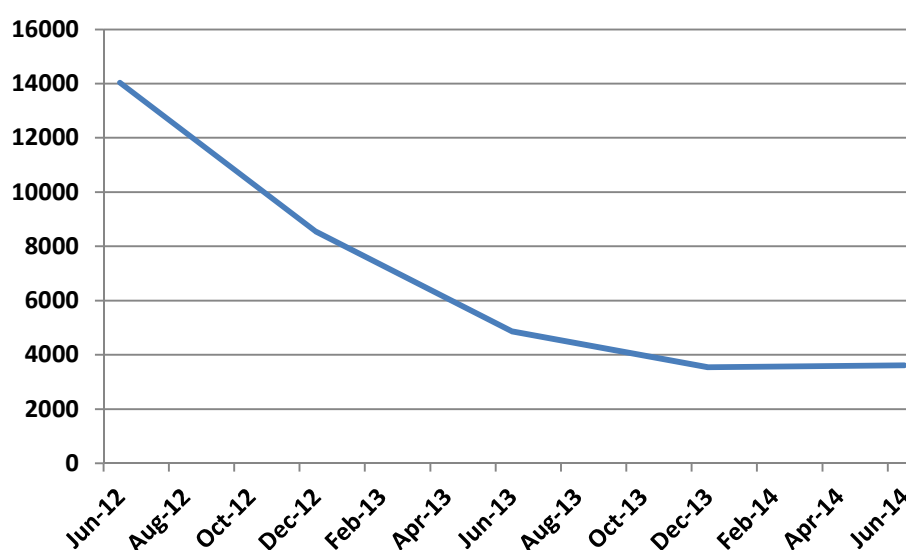
The demand for science and engineering professionals

The Internet Vacancy Index is showing a plummet in the count of new advertised online for science and engineering professionals¹⁷ of more than 75 per cent in the last two years. What we are seeing is Australian public policy beginning to reap what it has sown. It is all very well for governments to extol the virtues of our scientists, engineers and researchers, yet the reality is that more and more of them are finding themselves unemployed. This is the ultimate manifestation of an inadequate, insecure and needlessly complex funding environment for the innovation sector in Australia.

Advertised internet vacancies¹⁸

	Jun-12	Dec-12	Jun-13	Dec-13	Jun-14	% Change
Chemical and Materials Engineers	66	49	32	29	29	56%
Civil Engineering Professionals	4173	2847	1680	1345	1424	66%
Electrical Engineers	1072	570	381	270	307	71%
Electronics Engineers	132	78	76	63	53	60%
Industrial, Mechanical and Production Engineers	1957	998	751	593	564	71%
Mining Engineers	2786	1946	1002	587	511	82%
Other Engineering Professionals	573	379	240	187	219	62%
Agricultural and Forestry Scientists	26	12	12	11	11	56%
Chemists, and Food and Wine Scientists	177	142	161	142	147	17%
Environmental Scientists	912	605	234	145	157	83%
Geologists and Geophysicists	2022	825	191	83	82	96%
Medical Laboratory Scientists	72	55	54	48	49	32%
	14040	8547	4859	3539	3615	74%

Advertised vacancy trends



¹⁷ Department of Education, Employment and Workplace Relations. *Vacancy Report*. <http://lmip.gov.au/default.aspx?LMIP/VacancyReport>. Last accessed July 15, 2014.

¹⁸ Department of Employment. *Vacancy report*. <http://lmip.gov.au/default.aspx?LMIP/VacancyReport>

Where to from here – improving the situation?

Workforce development

An agile, experienced and highly-skilled science workforce undertaking R&D, utilising innovation and research undertaken elsewhere (and adapting it to the Australian context), and undertaking technical and technological innovative activity will be fundamental to productivity improvement in Australia over the next decade.

STEM-based employment

A sustainable and vibrant STEM workforce is the centrepiece of all knowledge-based economies, and is essential to virtually every aim we have as a nation.

The Australian Academy of Technological Sciences and Engineering (ATSE) suggests that 75 per cent of the fastest-growing occupations require well-developed STEM skills and knowledge. STEM skills are critical not only for core-STEM occupations and those who ACOLA describe as the “high-skill group capable in research commercialisable innovation and effective response to technological change” but also for ensuring tertiary graduates are able to meet the demands of increasingly technology-intensive roles across industry.

ATSE’s projections also show that STEM-based employment will grow at almost twice the pace of other occupations, and that currently 26 per cent of employers have difficulty recruiting STEM skilled professionals and managers.

In Australia roughly half of all professional occupations with identified skills shortages are in core-STEM areas such as engineering, and most of the rest are in the related area of health.

STEM education

Addressing the failures in quality and reach of STEM education is complex and requires long-term planning and commitment.

A strong supply of STEM graduates ready to work directly in core-STEM areas as well as in occupations which benefit from STEM-related competencies is essential to building our innovative capability.

The number of students studying STEM subjects at secondary and tertiary level are declining. While China and India build bigger and better knowledge-intensive economies based on increasing numbers of STEM graduates, the proportion of Australian students going into Year 12 physics, chemistry and biology have halved over the last 30 years – and the proportion of Australians graduating from universities in mathematics and statistics is less than half the OECD average.

ANET also has identified a widespread failure of students to engage in programs which encourage participation in or acceleration of STEM skills with the programs not being offered ‘in curriculum’. With competing demands on school teachers and students, effort must be made to ensure such programs are offered in curriculum, so that students can see and experience the practical application of science.

Recommendation 1 – STEM

Australia's STEM capability is fundamental to not only driving productivity improvement, supporting innovation and maintaining global competitiveness, but also to safeguarding standards across the Australian community, protecting the environment, improving human welfare and quality of life.

We recommend a committed, coordinated and strategic approach to investing in our science, engineering and technology capability, STEM education and STEM workforce.

Efforts should also be made to ensure STEM support programs in schools are offered as part of basic curriculum to ensure that the broadest range of students can see and experience the practical application of science and technology.

Acting to protect against deprofessionalisation

A combination of legislation, Australian Standards and the relevant codes of ethics alongside continuing professional development are the mechanisms by which high standards of professional practice and the relevance and currency of the qualification and experience are maintained for technology-based professionals. Deprofessionalisation is the systematic deskilling of professional positions. It is a process which occurs in a workplace or industry when non-qualified or less-qualified individuals are used to perform work which is more properly performed by appropriately qualified individuals.

The devaluing of professional work drives down standards and increases risk to the community – with the greatest and most obvious risks in the environmental, agriculture, medical/health and national security areas. It also creates increased liabilities for governments and businesses that cut corners on quality and high professional standards as the quality of products and services for which they are responsible are compromised.

For the engineering, science and IT workforces, it can lead to pay cuts, a lack of career progression incentives in classification structures, disaffection and lack of job satisfaction and problems attracting new graduates. In turn, this affects the long-term viability and sustainability of the science and R&D workforce and its capacity to support innovation.

Recommendation 2 - Deprofessionalisation

Deprofessionalisation:

- drives down standards - a failure to maintain professional standards results in compromised quality and risk to the community and increased liabilities for business and government; and
- is a key threat to a viable and sustainable science and R&D workforce and therefore to Australia's future innovative capability.

Because of this, the funding of science and engineering needs to operate from a cost base which recognises the importance of professional qualifications and protects professional standards, ensures quality and minimises risk to the community, business and government.

Maintaining in-house expertise

Informed purchasing

There is a strong need for government to understand the importance of maintaining in-house science, engineering and technology capability to ensure Government is an informed purchaser. This is particularly important in terms of outsourcing. Outsourcing and contracting out have two major consequences for public good in the context of innovation capability:

- the first is increased levels of unmanaged risk; and
- the second is the abrogation of one of the primary roles of government – that of acting in the interests of public safety and the public interest.

Maintaining strong in-house science, engineering and technology base provides the skills base for responding to innovation opportunities while protecting projects from waste of taxpayer dollars and inadequate or ill-informed project scoping and ensuring the public good.

Impartial and expert policy advice

While we have offices of the Chief Scientist or their equivalent across many jurisdictions in Australia, we have not systemic means of ensuring that scientific advice is accounted for or heeded in the framing of policy advice to government. Already there is despondency in much of the scientific community at the trend towards doubting science and prioritising short-term economic and political gain. As ANET has identified, the United Kingdom has accepted the need for evidence-based decision-making, and has integrated and made mandatory scientific and engineering input in policy making at every level.

Recommendation 3 – Maintaining in-house expertise

Governments have a responsibility to act in the interest of the wider public in terms of safety, public health and the public interest.

The funding of Government departments and agencies needs to operate from a cost base which protects the maintenance of appropriate levels of science and engineering expertise and recognises the importance of this expertise in effective and efficient decision-making, including in outsourcing.

We also recommend that scientific advice is given on all policy proposals to government and incorporated in coordination and comment to cabinet.

Broadening the skills base

Continuing professional development

Utilising continuing professional development (CPD) in a strategic and integrated way to enable technology-based professionals is essential to improving their job performance and allowing professionals to better respond to innovative opportunities and changes in their markets or operating environments.

Committed, skilled and experienced technology-based professionals are fundamental to high-performing and competitive enterprises which rely on a science, engineering and IT capability. Enhanced enterprise-based productivity and innovative capability will depend on its professional workforce being engaged, committed, interested in the potential to do things differently and equipped with the skills and flexibility to question existing processes and methods. Investing in CPD is a sound way to ensure that, at the enterprise level, organisations maintain a vibrant, agile, creative, empowered and inquisitive science and technology workforce.

In turn, only by improving organisational performance and competitiveness, can we ensure science, engineering and technology will play the central role it should in improving our national innovative capability, growing productivity and supporting emerging industries as we transition to a knowledge-based economy.

We need to be clear on the very real role that investment - in the science and technology workforce at the enterprise level, and in science and technology at the broader structural level - will play in improving organisational performance and contributing to national productivity. Now more than ever, we need to understand that in the same way that investment in CPD is a powerful predictor of organisational performance, investment in science, engineering and technology at the structural level is a predictor of national innovative capability and productivity.

Skills to encourage business acumen and greater commercialisation of research

The encouragement of skills development in areas such as entrepreneurial skills including business management, marketing, intellectual property etc. would support greater commercialisation as well as providing further career path opportunities for technology-based professionals.

Recommendation 4 – Broadening the skills base

To ensure a policy position on training and development which supports the development of skills which will:

- support the translation of discoveries into products and services to take to market;
- equip professionals with the skills to respond to innovative opportunities;
- encourage productivity at the enterprise level; and
- provide skills development to ensure a motivated, committed workforce of technology-based professionals.

Recommendation 5 – Workforce development

Professional Scientists Australia would welcome the involvement of a wide range of stakeholders in developing a workforce development plan to take the engineering, science and R&D workforce into the next decade.

Such a plan would include:

- ensuring an effective science and R&D skills pipeline from schools;
- strategies to enhance quality and fit of STEM skills supply from universities ;
- effective communication and structuring of career pathways into and within the science and R&D workforce;
- broadening the mix of workers in the science and R&D workforce by improving participation and diversity; and
- supporting and enabling continuing skills development.

Funding - investing strategically and sustainably

Funding of research is a defining issue for those working in the science and R&D field. A failure to provide adequate and reliable funding support for science and R&D will compromise our capacity to tackle the nation's biggest challenges and to grasp some of our greatest opportunities. We recently undertook wide-ranging research among our members. Adequate and sustainable research funding were seen as central to the government's economic strategy of improving our innovative capability, productivity improvement and investment in emerging industries as we transition to a knowledge-based economy. Governments must support planned, stable and appropriate investment in research over the long term, which is essential if we are to tackle large, complex problems and opportunities facing Australia.

Public funding of science research

The social benefits generated by Australia's public funding support of science are significant and investment in science and R&D over time outweighs the cost.

Funding levels

An overwhelming 90 per cent of our survey respondents said they supported maintaining scientific research funding at a minimum 2.2 per cent of GDP. When respondents were asked about the biggest issues facing science in the short to medium-term, 84 per cent said funding constraints were their biggest concern. 85 per cent said that funding that is strategic and sustainable to tackle long-term complex problems was the key change required in the short-term. Clearly levels of research funding are central to the viability, quality and sustainability of science and R&D in Australia.

The need for certainty and long-term security of funding for research and development in Australia is central to building an innovative future in this country. A long-term approach, allowing industry and the education sector to plan, cooperate and identify opportunities for investment and growth is critical.

Reviewing the way research funding is secured

We subject many of our scientists to a cycle of grant applications, about 80 per cent of which are unsuccessful. Review after review of science in Australia has made sweeping recommendations about the need to review how research funding is allocated.

Reduced complexity

A key element of public policy failure in innovation has been the complexity of funding arrangements. Accompanying uncertainty has been a range of funding mechanisms which require collaboration, partnerships, estimations of outputs and lengthy justifications which amount to a deterrent to apply for funding. Government should look to simplicity to accompany certainty, so that our scientific resources are employed productively in research and innovation, and not in the production of grant applications. Often it has seemed that these collaborations which the government has tried to foster have in effect amounted to funding for research institutions at universities and related entities. If the government wishes to fund universities to conduct research, they should determine to do so.

Incentive-based funding

Science, engineering and technology are the most valuable enablers of innovation in Australia. Government should look to implement funding mechanisms which would allow scientists, engineers and technology professionals to be engaged in innovation in a range of sectors. This may mean that we move away from project or sector specific funding programs whereby government effectively identifies 'winners' and instead move to a system where industry and education providers receive incentives to engage in research and innovation activities.

Investment in science and engineering research infrastructure

Investment in science infrastructure that supports research across a range of areas yields benefits beyond their actual cost.

Business investment

Research shows that public support of science brings with it business investment in research and improves rates of commercialisation. Australia has one of the lowest levels of government support for business R&D in the world. A recent report from the Melbourne Institute¹⁹ shows that Australia's commitment to business R&D is lagging well behind other countries with the US government committing over 0.22 per cent of GDP to business R&D and the UK Government 0.14 per cent while the Australian commitment sits at just 0.09 per cent. According to author Professor Beth Webster, the report shows that we are slipping behind not just other high-income countries but increasingly middle-income countries including Malaysia, South Korea and the Czech Republic.

Governments need to create an environment which encourages industry to invest more in research and which makes Australia an attractive place for international companies to undertake research. Long-term strategically-based investment by both government and business is essential if we are to compete globally and in our region. This includes a balance of investment and research in non-mining business activities as well as in natural resources.

¹⁹ Webster, E. (2014). A Proposal for Industry-Led Innovation Consortia, Intellectual Property Research Institute of Australia, and Melbourne Institute of Applied Economic and Social Research, The University of Melbourne, Melbourne Institute Policy Brief No. 1/14. Available at http://melbourneinstitute.com/downloads/policy_briefs_series/pb2014n01.pdf.

Bringing industry and academia together

When industry and researchers work together effectively we innovate and multiply our strengths. We must ensure there are clear and reliable policy incentives that facilitate deep and sustained collaboration between industry, public sector, university and research institutes.

Recommendation 6 - Funding

We recommend a committed, coordinated and strategic approach to funding our science, engineering and technology capability, in particular

- funding for STEM education and investment in developing the skills of STEM workforce throughout their careers;
- working towards increasing scientific research funding to 2.4 per cent of GDP and maintaining a position in the top half of the OECD table;
- adopting a longer-term planning focus for funding to ensure researchers spend more time on research and less time on grant applications;
- placing a hold on cutbacks or funding freezes in conjunction with a commitment to consultation with scientific research organisations and key stakeholders about the threats to organisational capabilities and risks to industry and community arising out of funding cutbacks; and
- reducing the complexity in funding arrangements for research and development by streamlining funding mechanisms and encouraging the direct engagement and retention of scientists and researchers.

A roadmap to an innovative future

Now more than ever, addressing the barriers to realising innovation through engineering, science, technology and R&D is critical.

Professionals Australia looks forward to working toward the development of policy initiatives with government and industry to help build our innovative capability, and workforce strategies at both the structural and enterprise levels to foster a skilled and responsive workforce that can best support innovation and in turn productivity improvement, global competitiveness and economic growth.

In transitioning to a knowledge-based economy, valuing the work of professional engineers, scientists and technology professionals will be fundamental to attracting top quality talent to these professions, to maintaining a sustainable, vibrant and committed workforce capable of driving innovation and ensuring they play the key roles they should in maximising our innovative capability as we move toward 2020.

Drawing on the evidence outlined in this submission and the views of our membership, we propose that a series recommendations be considered by the Committee.

Summary of recommendations

Recommendation 1 - STEM

Australia's STEM capability is fundamental to not only driving productivity improvement, supporting innovation and maintaining global competitiveness, but also to safeguarding standards across the Australian community, protecting the environment, improving human welfare and quality of life.

We recommend a committed, coordinated and strategic approach to investing in our science, engineering and technology capability, STEM education and STEM workforce. Efforts should also be made to ensure STEM support programs in schools are offered as part of basic curriculum to ensure that the broadest range of students can see and experience the practical application of science and technology.

Recommendation 2 - Deprofessionalisation

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Because of this, the funding of science and engineering needs to operate from a cost base which recognises the importance of professional qualifications and protects professional standards, ensures quality and minimises risk to the community, business and government.

Recommendation 3 – Maintaining in-house expertise

Governments have a responsibility to act in the interest of the wider public in terms of safety, public health and the public interest. The funding of Government departments and agencies needs to operate from a cost base which protects the maintenance of appropriate levels of science and engineering expertise and recognises the importance of this expertise in effective and efficient decision-making including outsourcing.

We also recommend that scientific advice is given on all policy proposals to government and incorporated in coordination and comment to cabinet.

Recommendation 4 – Broadening the skills base

To ensure a policy position on training and development which supports the development of skills which will:

- support the translation of discoveries into products and services to take to market;
- equip professionals with the skills to respond to innovative opportunities;
- encourage productivity at the enterprise level; and
- provide skills development to ensure a motivated, committed workforce of technology-based professionals.

Recommendation 5 – Workforce development

Professional Scientists Australia would welcome the involvement of a wide range of stakeholders in developing a workforce development plan to take the engineering, science and R&D workforce into the next decade.

Such a plan would include:

- ensuring an effective science and R&D skills pipeline from schools;
- strategies to enhance quality and fit of STEM skills supply from universities ;
- effective communication and structuring of career pathways into and within the science and R&D workforce;
- broadening the mix of workers in the science and R&D workforce by improving participation and diversity; and
- supporting and enabling continuing skills development.

Recommendation 6 - Funding

We recommend a committed, coordinated and strategic approach to funding our science, engineering and technology capability, in particular:

- funding for STEM education and investment in developing the skills of STEM workforce throughout their careers
- working towards increasing scientific research funding to 2.4 per cent of GDP and maintaining a position in the top half of the OECD table;
- adopting a longer-term planning focus for funding to ensure researchers spend more time on research and less time on grant applications
- placing a hold on cutbacks or funding freezes in conjunction with a commitment to consultation with scientific research organisations and key stakeholders about the threats to organisational capabilities and risks to industry and community arising out of funding cutbacks, and
- reducing the complexity in funding arrangements for research and development by streamlining funding mechanisms and encouraging the direct engagement and retention of scientists and researchers.

Related documents

Realising an Innovation Economy <http://www.professionalsaustralia.org.au/download/?dIID=1289>

Still the Clever Country? -

<http://www.professionalsaustralia.org.au/groups/scientists/advocacy/?id=3113>

Realising Innovation through Science and R&D -

<http://www.professionalsaustralia.org.au/groups/scientists/advocacy/?id=3114>

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