Public Support for Science and Innovation

Submission to Productivity Commission

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Table of contents

Section			Page
1.	INTRODUCTION		1
2.	ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS		1
3.	IMPEDIMENTS IN AUSTRALIA'S INNOVATION SYSTEM		3
	3.1	Availability of technology resources	3
	3.2	Corporate Culture	5
	3.3	Government incentive programs	5
	3.4	Education and skills	6
	3.5	A national strategic approach	13

1. INTRODUCTION

Engineers Australia is the national peak body for all engineering disciplines. We represent over 80,000 engineers. Engineers Australia is committed to enhancing the reputation and standing of the profession and its practitioners. It accredits engineering courses in Australia, operates programs of continuing education and professional development, maintains a vigorous publishing and conference program and involves itself in debate on national and community issues.

Engineering has always been central to the economic growth that has characterised the rise of industrial capitalism. As we move further into a knowledge-based economy, it remains a fundamental element of the nation's social and economic potential. In the innovation literature, a strong science and engineering base has been identified as a distinct component within the framework of innovation systems.

There is often a misunderstanding by governments and others about what innovation involves and hence, the role that engineers play in publicly funded innovation programs. Innovation can involve many types of activity, including research and development. In the minds of many people there is a view that innovation involves scientific investigation of one kind or another. However, scientific research does not by itself easily translate into innovation. In many cases, it is engineering that provides a bridge between science and technology, and between technology and commerce. Engineering plays an essential part in meeting the material requirements of society and in the generation of wealth. It is the engineers who translate technology into the resources and products of the future. This must be borne in mind when looking at the question of Australia's publicly funded innovation systems.

Australia has taken many steps to strengthen its presence on the world stage. We have instituted measures to put us on a path to meet the economic, social and environmental needs of our society. However, in spite of efforts over the last decade to broaden the base of the economy, Australia is below advanced industrial countries in the production of high technology goods and services that constitute the fastest growing area of world trade.

In the international arena, the pace of development is quickening. For Australia to participate, we must pursue scientific and technological advances. Australia must develop technologies that will ensure the competitiveness of our goods and services in the global marketplace of the future.

Australia's publicly funded innovation policies and programs are integral to ensuring that we become a strong player in world markets, and in solving domestic economic, social and environmental issues. Governments play a central role in guiding and directing future efforts in innovation. Governments have an obligation to act as leaders, and this is best achieved by directing the way in which public money is allocated.

2. ECONOMIC, SOCIAL AND ENVIRONMENTAL IMPACTS

It is well recognised that innovation, both technological and non-technological, is a key driver of economic growth. The innovation process includes many factors. While R&D is not an isolated activity and is a means to an end, it is an essential element of Australia's innovation system.

As recognised by the Mortimer report "Going for Growth" (1997)[1], innovation accounts for an estimated fifty percent of long term economic growth in advanced industrial countries. The report also noted that there was a high correlation between the wealth of nations and R&D intensity.

Innovation improves efficiency and productivity, and therefore the competitiveness of industry. Innovation produces new and improved products and assists companies increase their capacity to compete in domestic and world markets.

Innovations provide benefits beyond that originally envisaged by the original researchers (whether publicly or privately funded). There is strong evidence to suggest that R&D generates positive externalities among the users of R&D throughout the economy, that is, R&D benefits firms and individuals other than the original research project. New knowledge is rarely confined to one body or firm. Knowledge is disseminated to other bodies or companies, and can be used repeatedly at little extra cost to the users. As well, new knowledge can be generated from the initial R&D, which can, in turn, raise the productivity of other companies, and increase economic growth. Therefore, R&D can have a permanent positive effect on the long run rate of economic growth.

It must be noted that R&D is not costless, and that every R&D project will not generate externalities. However, in the aggregate, there are significant benefits for the Australian economy if there is an increase in R&D activity supported by public funds.

Some other factors of increased R&D activity that impact on the economy include import replacement, foreign currency income from increased exports, and direct effects on employment, education and training,

For instance, a direct impact of increased private sector R&D is on import replacement. R&D can produce cost competitive, technically comparable and equal or superior quality Australian made products, reducing the need to import products. There appears to be a lack of appreciation that expenditure saved by purchasing local products is the same as income obtained from exporting.

Well-planned and executed research, development and commercialisation will obviously generate foreign currency income to Australia from exports.

Other obvious consequences of greater innovation, increased R&D and successful commercialisation are:

- Increased business activity and improved employment levels.
- Increased demand for training and skills development, with a consequent increase in University and TAFE enrolments.
- Increased need for immigration by skilled/qualified persons.
- Increased conversion from low priced resource exports iron ore, aluminium, etc, into higher value added finished goods or components.
- Reduced reliance on being a cost-effective exporter of minimum value added resources in a world market where low cost exporters of raw materials are increasingly driving down our export pricing.

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[1] David Mortimer *Going for Growth, Business Programs for Investment, Innovation and Export,* Commonwealth of Australia, June 1997

- Increased overall earnings, which would have a flow on effect on spending, quality of life and affordable products within our community.

3. IMPEDIMENTS IN AUSTRALIA'S INNOVATION SYSTEM

Governments of the past funded and performed research in the interest of the public good, and where market mechanisms were not responding to the nation's needs. Over time, this view has changed somewhat to place a focus on programs and policies that more closely align research and development activities with industry. Engineers Australia support this approach, but believes that this should not be at the expense of independent and long term research for the common good, in areas such as public health and the environment.

Having said this, there are many inhibitors and drivers of innovation that relate specifically to raising the level of research related to industry that will have a direct effect on the economic and social well being of Australia. Engineers Australia has identified the following issues as those that need to be addressed in the immediate future to improve Australia's innovation system:

- Availability of technology resources
- Changes to corporate culture and informed clients
- Government incentive programs
- Education and skills
- A national strategic approach to R&D

3.1 Availability of Technology Resources

There needs to be a stronger linkage between industry and the higher education sector if Australia's publicly funded R&D system is to work efficiently.

Many small and medium businesses fail to innovate, or are unsuccessful in the commercialisation of R&D because of a lack of access to information and/or skills to make informed decisions about investments in R&D. In many instances, this information is available, but companies do not know where to access it. Government programs designed to assist collaboration between companies and provision of advisory support are beneficial, and should be better promoted to encourage greater private spending on R&D.

There are some significant government programs developed at a Commonwealth and State government level to assist with collaboration and linkage issues. One of the most successful is the CRC program, and Engineers Australia believes that funding for this program should continue into the future. However, programs such as the CRC program generally benefit the larger companies, rather than the small to medium sized enterprise.

Engineers Australia believes that there needs to be an increased focus on encouraging collaboration between small and medium enterprises with universities, TAFE's, and other publicly funded organisations, such as the CSIRO.

Most small and medium enterprises know nothing about assistance packages for collaboration or what facilities are available within research organisations. If this collaboration was better understood and utilised by small and medium enterprises, and taken further by the universities, TAFE's, and government R&D organisations, it would be another source of income for all concerned.

It would also have the flow on effect to those small and medium enterprises that benefited from the collaboration, to employ higher qualified persons, thus increasing enrolments in the Universities, and TAFE's.

There is a shrinking limit to which industry will undertake research within Australia. The dramatic fall in business expenditure on research and development in recent years impacts on a university's ability to access new research partners in industry and to access outside sources of funding. These two factors place limits on the ability of universities to provide the required research infrastructure and the high standard of undergraduate teaching necessary to create the skilled workforce vital for Australia to remain a significant player in the world economy.

Universities are a fundamental component of Australia's success in a knowledge-based global economy and as such, government must continue to take its fair share of responsibility in funding them, rather than relying on industry to provide increasing levels of funds, or relying on increases in full fee paying student numbers. Reduced funding can only lead to reduced achievement by graduates. Tertiary funding must be seen through such parameters as staff student ratios, practical content in courses and access to modern technology.

Communications between researchers is well recognised, as evidenced by the recent announcement by the Minister for Education of funding to six new projects to enhance communications between researchers. The Minister could boost Australia's R&D capability could be boosted even further by bringing industry into the equation.

A very simple approach to solving one of the issues related to knowledge transfer is to have a register or database of research projects available to interested industry participants. This register needs to be accessible from a central place, preferably managed by the Department of Science, Education and Training, given that they already collect information from the higher education sector on a regular basis. This information should not be held under lock and key by a university, or worse by different faculties within the university. The lack of easily accessible information on research projects discourages industry from involving itself with the higher education sector, or other research institutions. This particularly applies to small and medium sized enterprises.

Leading on from the DEST report of June 2005[2] about the exchange and diffusion of knowledge from universities and research institutions, Engineers Australia believes that closer industry involvement will not come about until steps are taken by universities to actively involve industry, not only in teaching outcomes, but in research programs. Most, if not all universities have industry liaison or advisory bodies in some form, but these could be significantly strengthened.

With 64% of business R&D performed in firms of less than 500 employees, it is difficult for Australian industry to articulate its changing needs to academia. Most industry-academic liaison is on an ad-hoc, one to one basis, and is not well coordinated. Therefore, the results are mostly short term. Cohesive industry involvement in course design and university research programs requires greater involvement and coordination by industry associations and individual businesses.

[2] Department of Education Science and Training, Knowledge Transfer and Australian Universities and Publicly Funded Research Agencies, prepared by the consulting firm PhillipsKPA. Completed in March 2006

3.2 Corporate Culture

Australia's innovation policies and programs are supply oriented. The lack of demand for novelty can and does form a significant barrier to innovation. Demanding consumers are important for stimulating and sustaining innovative firms. Therefore, encouraging a culture that seeks innovation needs to be a key component of innovation programs and policies.

Whether funded publicly or privately, leadership is a vital influence in a company's decision to be innovative and to undertake R&D. Leadership is required to drive and influence management culture and practices so as to seek continuous improvement and excellence. As well, there must be continuing determination to support development of new products and services. The lack of risk taking and leadership within management constrains innovation. Other constraints include the tendency to "when in doubt-don't" and conservative "risk" management

Innovation is obviously not simply the production of ever-new technological products. Leadership and corporate culture are the major ingredients in decisions to be innovative. The 1995 Karpin Report, *Enterprising Nation*,[3] identified this issue and focussed on the need to develop an enterprise culture in Australian management. This conclusion still holds true in 2006. Given that leadership is emphatically identified as the main factor influencing innovation, educators need to address this issue as part of business courses.

Creating the conditions in which leaders are willing to take risks cannot be simply addressed once people are in senior management positions. Many of the attributes need to be developed earlier on in people's lives. Therefore, opportunities should be offered to students throughout their school lives, exposing them to new ways of thinking, thereby creating new conditions for this learning to occur**.** As well, industry should encourage future potential business leaders within individual organisations.

Part of cultural change also includes better informed clients. Well informed clients are a vital factor in encouraging innovation and R&D. In particular, government as an informed client can have a significant effect on the amount of innovation that is carried out. Clients must be willing to accept innovative solutions. Engineers Australia's research shows that customers who were unable to assess the technical components of new methods or products were unwilling to investigate them, and are a major impediment to innovation. Customers are reluctant to be the first recipient of a new solution, and there is an overall tendency to select on price rather than 'whole of life'.

Government needs to acknowledge that it can influence innovation by influencing value perception (not simply price) and should develop mechanisms for accessing technical expertise when required, within the contracting process.

3.3 Government Incentive Programs

In the twentieth century, economic leadership became a matter of strategic investment in R&D to deliberately invent new technologies. Germany, the US, Taiwan, Singapore and Ireland have all invested heavily in supporting their R&D base. It is important in this context to recognise that in providing incentives that target R&D, the incentives need to fit that development model.

[3] Industry Taskforce on Leadership and Management Skills, *Enterprising Nation: Renewing Australia's Managers to meet the challenge of the Asia Pacific Century*, Australian Government Publishing Service, 1995.

Incentives can take many forms. Market based incentives can be in the form of grants, repayable grants, loans, interest rate subsidies, and tax concession and incentives. Direct government assistance is an incentive to innovation and R&D.

Tax measures have many advantages. For instance, they are market driven, can have relatively low administration and compliance costs and are generally available to all eligible companies, regardless of the sector in which they operate. The R&D tax concession has been extremely successful, and Engineers Australia supports its continuation. Where successfully applied by companies, it has the added advantage of providing government with taxes after the initial development period, which can, in many cases, adequately cover the initial outlay. However, business has been deterred from investing in R&D by frequent changes to incentives, and by the reduction in their value.

There is general agreement that competing on a global scale with high margin innovative products and services requires a commitment by government to fostering high export, high and new technology industries. That support does not amount to "business welfare", but rather is a strategic decision with huge pay back for Australia.

Engineers Australia believes that government must increase market based incentives to raise the level of business research and development in Australia. Australia does not currently have the level of research and development appropriate to our industry structure in comparison to other countries that have policies and programs to encourage infant industries. Industry does not always have the necessary capacity to develop new technologies, and therefore relies on public investment. Therefore, the CSIRO and other publicly funded research organisations must continue to undertake research into areas of strategic economic, environmental and industry importance to Australia, and as such, must be fully supported.

One of the most successful government programs is CRC program, and Engineers Australia believes that funding for this program should continue into the future.

3.4 Education and skills

Skilled labour is fundamental to innovation and national growth. As Australia moves further into the knowledge-based economy, our prosperity and lifestyle become dependent on our ability to invest in and reap rewards from a strong skills base, a skilled workforce, and well led and well managed enterprises.

Engineering plays an essential part in meeting the material requirements of society and in the generation of wealth. It is the engineers who transform technology into the resources and products of the future. Employment of well-qualified engineers and scientists pays off in terms of a nation's competitiveness. This is especially so in relation to high quality, high technology industries. The use of highly skilled engineers can increase a company's productivity and profitability and through it, the nation's economic performance.

Conversely, fewer and less skilled engineers and scientists and the associated diminished innovative activity adversely affects domestic market share for local goods and services, decreases international trade share, and erodes product quality and variety.

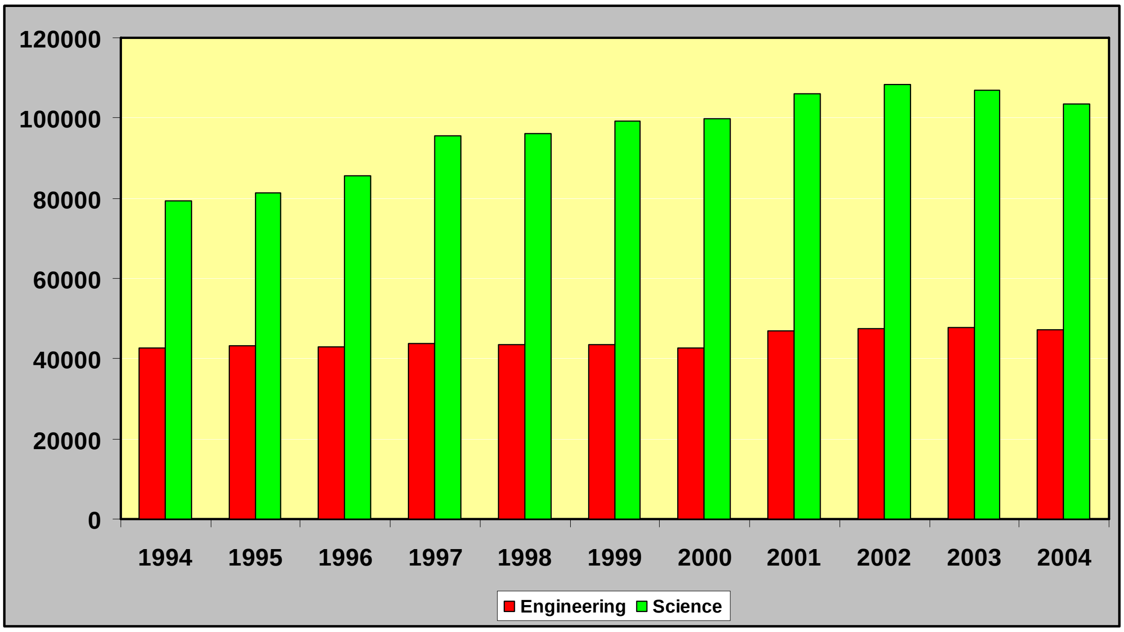
According to OECD figures, Australia's stock of human resources in Science and Technology including engineering has improved over the past ten years, rising from 476,000 in 1996 to 560,000 in 2001, an increase of 17.6% over the five year period.

In relation to Australia's age structure, the number of Australians with a university education and the number entering university are also around the OECD mean.

There is an increasing trend, particularly in government circles, to use the word "science" as an all-inclusive term for "science, engineering and technology". But care needs to be taken in interpreting data grouped in this way. A Department of Education, Science and Training publication *Australian Science and Technology at a Glance*, released in 2005 indicates a healthy growth in the numbers of science and engineering graduates between 1989 and 2002.

In 2000, 19.7% of new graduates in Australia received science and engineering degrees, compared to 21.7% of graduates in the OECD. But when the data are split into science and engineering, the real picture begins to emerge. While around 11.8% of new graduates in Australia were awarded science degrees, engineering graduates accounted for only 7.9% of total graduations in Australia. The graduation of approximately 5000 students from engineering degrees each year, for the past 10 years, means that the growth in Australia's science and engineering graduates has come from increased science enrolments alone. (Figure 1).

Figure 1 - Student enrolments in engineering & Science 1994 - 2004



Source: The Engineering Profession: A statistical Overview 2006, Ed 4 Engineers Australia

Like the trends in science and engineering graduations, the numbers of science and engineering PhDs being awarded has increased since 1989 with a steadying of the numbers since 1997. Compared with total PhDs awarded, however, the percentage of science and engineering PhDs has dropped from 45.9% in 1989 to 37.2% in 2002. Engineering PhDs number fewer than half the Science PhDs, further compounding the skills shortages in the engineering sector.

These data point to the balance between engineering and science being out of alignment at a time when we should be as focused on converting ideas into products, as we are on conducting and publishing research.

Scientific advances represent enormous potential, but commercialisation is constrained by a disproportionately limited engineering skills base. As a result, Australia is losing its ability to compete successfully in the rapidly growing knowledge-based economy.

There is a myth that scientific research satisfies Australian industries' R&D needs. Most industry-relevant R&D is undertaken by companies, and mostly in the manufacturing sector.

Should Australia choose to bolster its engineering R&D and design capacity, shortages of local engineers might take a generation to redress.

Typically, skills shortages occur when there is a lack of adequately skilled individuals at current levels of pay, conditions of employment and geographic location. In other words, skills shortages exist when employers have difficulty filling, or are unable to fill, vacancies in recognised occupations and specialisations or common occupational groups.

Australia has been unable match the production of engineers to demand and appear to have cycled through times of having too many and too few. This is not surprising given that it may be longer than 15 years from the time we interest a child in engineering to the time he or she becomes one. This indicates that forecasting and planning are not good enough to cope with a lead time of this magnitude.

According to the 2001 Australian Census there are:

- 21,356 professional engineers if an engineer is defined as a person having a bachelor degree or above who practises engineering without any management roles. This definition would include an Electrical Engineer but not Construction Project Managers, Engineering Managers or Production Managers.

- 44,822 professional engineers if an engineer is defined as a person having a bachelor degree or above, or who has an occupation title associated with either management or non-management engineering. This definition would include all of the examples I mentioned previously.

- 193,399 professional engineers if an engineer is defined as a person having a bachelor degree or above in the field of study entitled Engineering and Related Technologies.

An assessment of the number of professional engineers by Engineering Occupation shows that there are only small numbers of engineers working at the technical level as petroleum, agricultural, biomedical, chemical, and industrial engineers.

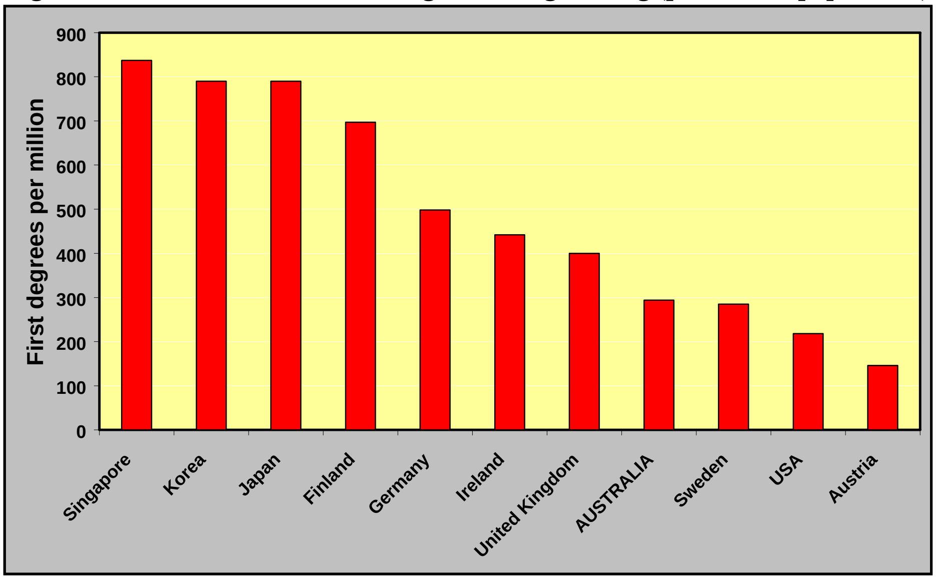
The average age of a professional engineer is 37.1 years. An engineer employed in the manufacturing sector would be on average 43 years old - the oldest average age in the engineering profession. Engineers employed as software designers are the youngest in the engineering profession with an average age of 33 years.

These data suggest that long-term shortages will emerge for a large number of engineering disciplines.

Ageing of the population will also play a part in future skill shortages. For every young person entering the employment market today, there are already seven workers over the age of 45. 170,000 people now join the workforce each year, but only 125,000 will join in the entire decade from 2020.

Internationally, the number of Australian engineering graduates per million lags behind most of the other OECD countries. (Figure 2)

Figure 2 - Annual number of first degrees in engineering (per million population)



Source: The Engineering Profession: A statistical Overview 2003, Ed 3 Engineers Australia

In the decade that our engineering graduate numbers remained static, the number of full-fee paying overseas students graduating from Australian universities trebled to 3,000 per year.

Other official statistics lump university science and engineering statistics together, and take a very broad and unhelpful approach to engineering employment in Census data.

To overcome these problems, Engineers Australia recently published a new statistical overview of our profession[4]. Chapter 7 deals with engineering skills and develops a "Skills Shortage Index" for graduate engineers shortages using data prepared by the Graduate Career Council of Australia.

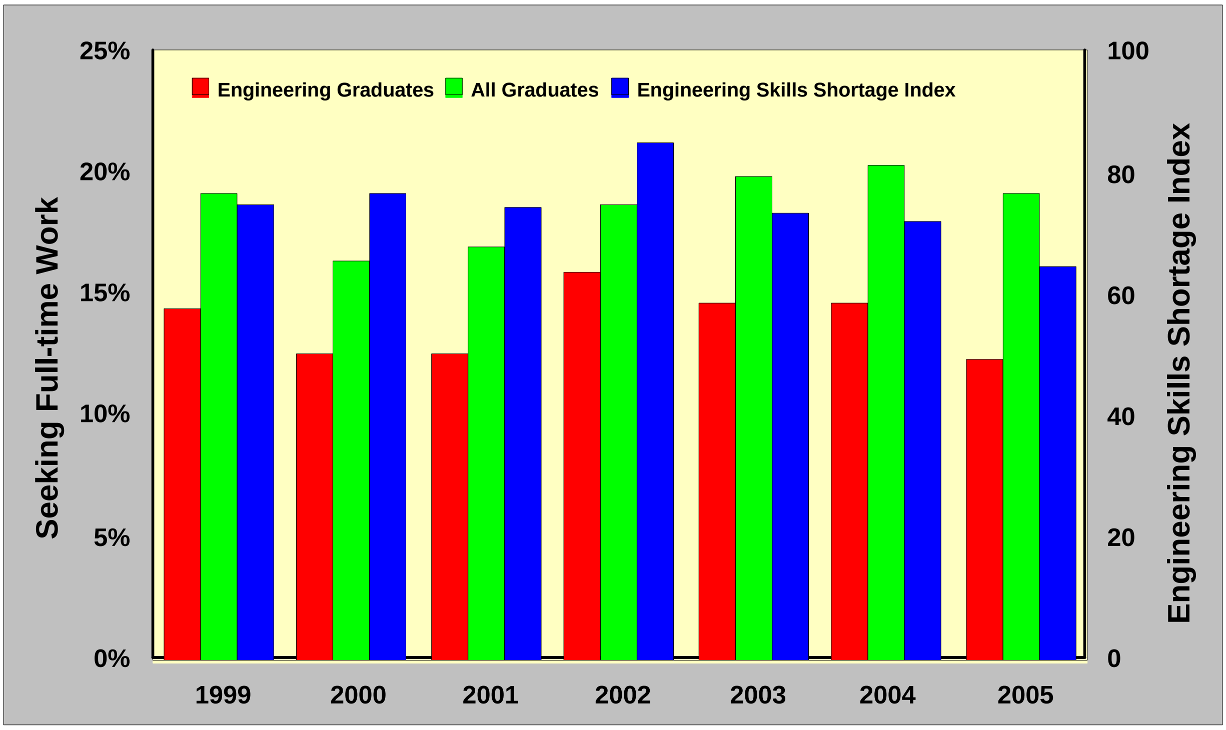
Each year, the Graduate Career Council releases information on the proportions of new graduates in full-time work and those looking for full-time work. These data enable a comparison to be made of the proportion of unemployed engineering graduates to the proportion of unemployed graduates across all disciplines. These relativities depend on overall economic circumstances and can be expressed as an index number.

When the two unemployment rates are equal, the prospects of full time employment for the two groups are equal and the skills shortage index would equal 100. A relative over-supply of engineers would be indicated by an index number greater than 100, because the unemployment rate for engineers would exceed the average for other graduates. Conversely, a shortage of engineers would be indicated by an index number less than 100, because the unemployment rate for engineers is less than the average for other graduates.

By comparing the data for the last seven years, we have found there has been a relative shortage of graduate engineers each year and, importantly, this relative shortage has become more acute in recent years. (Figure 3)

[4] Engineers Australia, "The Engineering Profession: A Statistical Overview 2006"

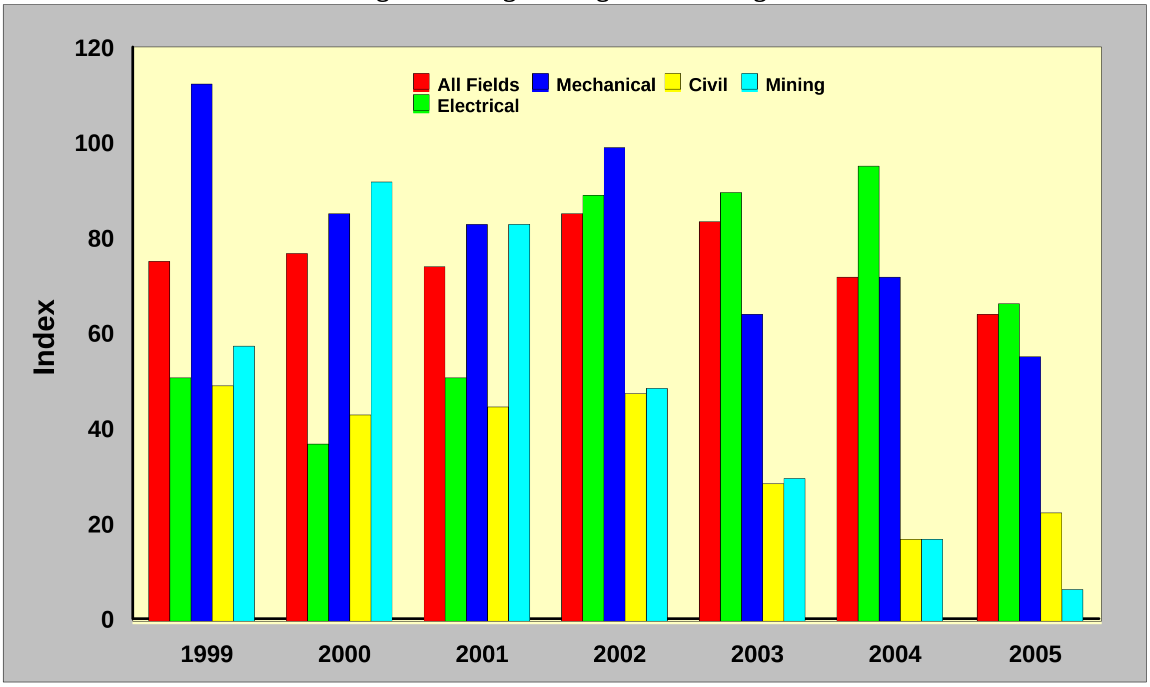
Figure 3 - Graduates seeking full time work (index <100 indicates relative shortage)



Source: The Engineering Profession: A Statistical Overview, 2006, Edition 4, Engineers Australia

If a similar methodology for the different engineering disciplines is adopted, we can show that the across-the-board shortages of engineers are more acute in Electrical, Mechanical Civil and Mining Engineering – particularly the latter two. (Figure 4)

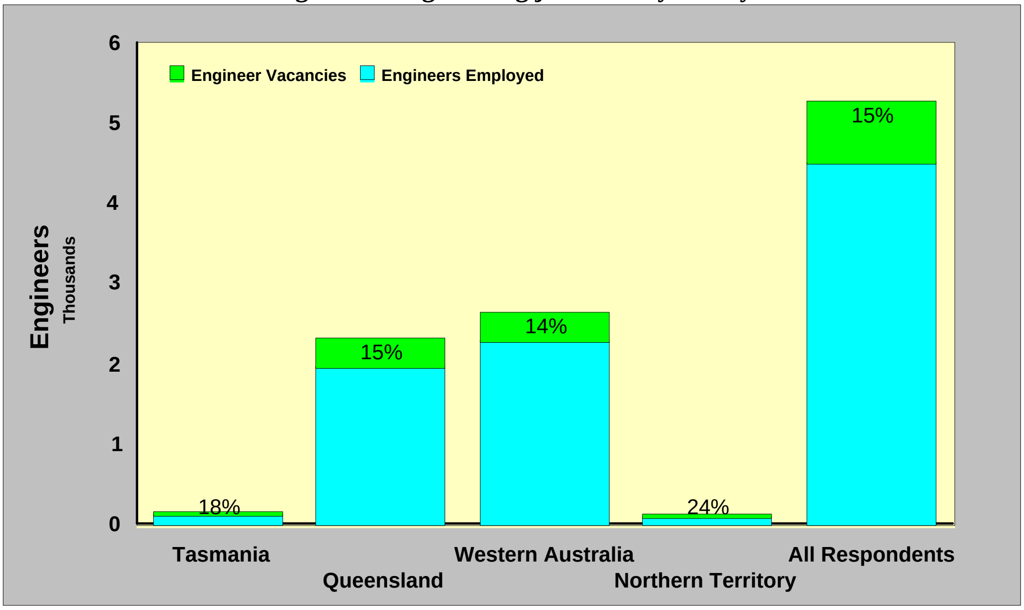
Figure 4 - Engineering skills shortages index



Source: The Engineering Profession: A Statistical Overview 2006, Ed 4 Engineers Australia

Engineers Australia has absolutely no doubt that Australia is currently experiencing an engineering skills shortage and that this shortage will be exacerbated unless corrective action is undertaken. This conclusion is further strengthened by an informal telephone survey conducted by Engineers Australia to gauge the degree of professional engineering skills shortages across Australia. The purpose of the survey was to add to the numerous anecdotes received by Engineers Australia. While the number of organisations surveyed is small, as a first step, this survey provides a quantitative element not previously available in our discussions about engineering skills shortages. (Figure 5)

Figure 5 - Engineering job vacancy survey



Source: The Engineering Profession: A statistical Overview 2006, Ed 4 Engineers Australia

In all, 33 organisations were surveyed – 13 government organisations, 18 private sector businesses and 2 recruitment agencies. All reported that they have experienced professional engineering skills shortages. Between them, these organisations currently employ 3743 professional engineers - and they have vacancies for another 777 – about 21% of the current employment level.

Shortages vary across the States and Territories and appear to be more severe in smaller jurisdictions. Most of the respondent organisations have experienced skills shortages for longer than 12 months. None of the organisations surveyed expected the situation to improve in 2006; two-thirds expected it to worsen.

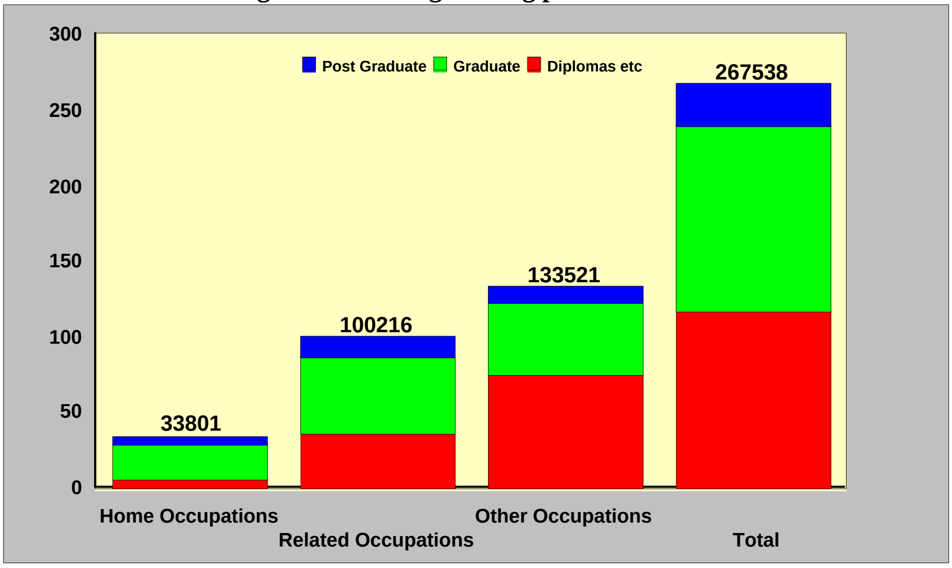
The shortage of professional engineers and engineering technologists and technicians is not just an education problem, or an economic problem, or an industry problem. The solutions will only be found through co-ordination at the highest levels of government and the involvement of education, industry and technology portfolios, industry itself and the engineering profession.

Part of the problem stems from the lack of reliable data. It is apparent, that many government analysts view the engineering profession as only those employed in technical engineering occupations. At the moment, there is no way to compile complete data on the engineering profession to properly understand where engineers are, what they are doing, and how many other engineers are working with them.

Published data from the Census, other Australian Bureau of Statistics and from the Department of Employment and Workplace Relations, only capture those engineers working in technical areas, and not the profession as a whole.

In the Engineers Australia Statistical Overview, we have attempted shed some light on this problem using unpublished ABS Census data.

Figure 6 - The engineering profession 2001



Source: Estimated unpublished 2001 Census data supplied by ABS

Figure 6 groups individuals with engineering qualifications, by their broad occupations. An engineering home occupation, is one closely associated with its essential qualification; for example, a Civil Engineer. A related occupation is one in which engineering qualifications are necessary, but are not closely identified with this qualification; for example, Engineering Manager. People in the other occupations category are not easily identifiable as having engineering qualifications.

Engineers Australia believes that the main problem in addressing skills shortages is how government agencies interpret the available flawed data. In their minds, there cannot be a skills shortage when only 34,000 people are employed as engineers in engineering occupations in Australia, while there are more than 267,000 people with engineering qualifications.

It has also been suggested that, if skill shortages do exist, it is simply because engineering firms cannot attract and keep staff, or prevent them from moving into other occupations. Comments that enough engineering skills exist in Australia, and that employers will need to implement effective polices to attract and retain staff to deal with skill shortages, simply do not reflect the current reality.

If other industries are employing engineers to be marketers, finance consultants or general managers, it follows that we need to train more engineers in total, to ensure there are enough skills to meet both the needs of traditional engineering sectors like construction, manufacturing and mining, and the economy as a whole.

If the engineering skills shortage is not addressed, Australia's capacity for innovation will be irreparably harmed.

3.5 A National strategic approach

Australia's system for R&D has been described as pluralistic in that it is highly decentralised and is composed of a number of independent and autonomous entities. There is a tendency for individual agencies to establish their own R&D programs in competition against other agencies at the Commonwealth level, and also at the State and Territory Government level. As well, because of the numerous government programs in existence, it is difficult to determine the process that is used in allocating R&D funding. The application process, selection criteria, and composition of the selection committee for applications for funds are also difficult to determine, with many inconsistencies between programs.

Because Australia's current approach to innovation is pluralistic, it is expected that will be overlaps and gaps. Because of the breadth of Australia's current system, and the federal nature of Australia's governmental structure it would be impossible to implement a highly structured, centralised approach to funding, and Engineers Australia believes that this approach could stifle research in many areas.

However, pluralistic systems can become directionless without an overarching plan to guide government and industry researchers. Stocker[5] made the point that if Australia's advisory mechanisms were working effectively, our pluralistic system would function well. That is, that the advisory mechanisms would provide a coordination role, so that many of the gaps and overlaps would be dealt with. It is Engineers Australia's view that even though structural changes have taken place, there remains a lack of effective coordination between and within Commonwealth, State and Territory programs and initiatives.

One of the issues that arose in reviews of Australia's innovation systems over the past 10 years was that there is a lack of cohesion, and poorly linked advisory mechanisms for government. It is Engineers Australia's view that because control of programs and funds is decentralised within and between Commonwealth and State and Territory government and research organisations, and because there are inadequate coordination mechanisms, government expenditure on R&D is still fragmented, complicated, and often unaccountable.

For instance, Engineers Australia identified well over 100 Commonwealth, State and Territory programs to support innovation and R&D in Australian firms in its 2002 publication "Research and Development: Which Direction", which identified many overlaps and gaps between programs.

Good coordination depends heavily on government advisory bodies. These provide a mechanism for the research community and industry to provide information and advice to decision makers on the potential contribution of science, engineering and technology to national innovation systems. They also provide a forum for considering long term issues or specific opportunities and weaknesses and a means whereby the implementation of innovation programs (including R&D) can be coordinated.

Because one of the main functions of an advisory body is to provide advice at the very highest levels of government, their influence on the decision making process is considerable. In Australia, advisory bodies are an integral part of the national innovation system. The Commonwealth, and most State and Territory Governments have formal advisory bodies for science, engineering and technology matters, which includes R&D issues.

5 Professor John Stocker, Priority Matters, Commonwealth of Australia, 1997

Those Australian governments that have formally constituted advisory mechanisms have chosen a representative style body. These integrate advice by representing a range of stakeholders. The membership is usually presidents of academies, heads of institutions and professional bodies and government representatives. The key role of these advisory bodies is to advise on directions for research programs to ensure the goals of the community are met.

However, there is no overarching body that takes an active role in filling strategic gaps or reducing the focus in areas of significant overlap. Whilst each department and research agency undertakes an annual review of its funding of research and industry, there appears to be no auditing across the spread of programs between agencies. This often results in either duplication or gaps in funding.

Governments have adopted areas of specialisation for their particular regional circumstances or where there is particular expertise and skill. There is no coordinated approach to investment, and there are some areas that overlap between State and Territory governments and the Commonwealth Government in terms of funding allocations. As well, the States and Territories are replicating the Commonwealth Government's investment in biotechnology and ICT, and replicate other State investment in agricultural R&D.

Because there is no overarching strategy in place, there is a tendency for individual agencies to establish their own R&D programs in competition with other agencies at both the Commonwealth, and the State and Territory Government level.

The many gaps and overlaps, and the lack of coordination and lack of transparency give the appearance that Australia's R&D funding programs are unaccountable and uncoordinated. One of the consequences of the lack of coordination is that there may be insufficient funds to take advantage of major opportunities or address major challenges. There will be instances where a national approach is essential to ensure that Australia has the best possible opportunity to succeed in world markets.

As well, greater efficiencies will be achieved if R&D funding occurs in a planned and coordinated manner. A properly informed, flexible and responsive national strategic plan for R&D would be able to address and respond to challenges, fill gaps where there is a strategic advantage in doing so, and eliminate unnecessary overlaps.

A strategic approach to R&D will also improve business cooperation, promote risk sharing, and make business and government take an active part in addressing the changing global environment. A strategy will provide industry, market analysts and investors with greater confidence to invest in R&D, particularly for high-risk technologies.