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Review of the National Innovation System – Submission  
Secretariat to the Expert Panel,  
Review of the National Innovation System,  
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#### **SUBMISSION TO THE REVIEW OF THE NATIONAL INNOVATION SYSTEM**

The purpose of the Business/Higher Education Round Table (B-HERT) is to pursue initiatives that will advance the goals and improve the performance of both business and higher education for the benefit of Australian society. B-HERT is the only body where leaders of Australia's business, research, professional and academic communities come together to address important issues of common concern, to improve the interaction between Australian business and higher education institutions, and to help guide the future directions of higher education.

In pursuing this mission B-HERT aims to influence public opinion and government policy on selected issues of importance. B-HERT believes that a prerequisite for a more prosperous and equitable society in Australia is a more highly-educated community. In material terms it fosters economic growth and improved living standards - through improved productivity and competitiveness with other countries. In terms of equity, individual Australians should have the opportunity to realise their full social, cultural, political and economic potential.

Membership of B-HERT comprises Australian universities, corporations, professional associations, the major public research organisations (Commonwealth Scientific and Industrial Research Organisation and Australian Nuclear Science and Technology Organisation).

B-HERT pursues a number of activities through its Working Groups and active alliances with relevant organisations both domestically and internationally. It issues a range of publications, and conducts conferences, seminars and workshops on current issues of concern relevant to its Mission.

B-HERT believes there are a number of key issues which need to be addressed which underpin an effective national innovation system in Australia.

B-HERT has no interest or affiliation relating to the subject of the review other than its relationships with its members.

## 1 A critical shortage of engineering, science, and mathematics graduates.

Australia's economic future is dependent upon the effective management of globally competitive and innovative enterprises. Human capital is a key element. The engineering graduate of tomorrow will be different from today's. How different is the issue? B-HERT believes there is a need to focus on the knowledge, skills, and attributes those entering the engineering profession will need in the future.

Engineers, be they civil, electrical, mechanical, chemical, electronic, information technology, mining, metallurgical, hydraulic, environmental, biomedical, or any other branch of the science, play an integral and critical role in every sector of business and industry, from basic R&D to final outcome. They are crucial to the nation's future.

Australia graduates about 5000 engineers a year, but first year engineering enrolments are decreasing. Between 2001 and 2005 the number of Australians commencing degrees in engineering fell by more than 8 per cent. At the current rate Australia will (in terms of graduates per million of population) fall from fifth last in the OECD to third last in the next two years. We will be graduating 16 per cent less than the number awarded in 1998. Mexico and Turkey will have overtaken us.

In 2003 China awarded 351,537 bachelor degrees in engineering (cf. US National Science Foundation Reports). But the really significant aspect is that this is **three times** the numbers who were graduating 15 years ago. **Forty per cent of Chinese graduates are engineering graduates. In Australia only 10% of graduates are in engineering- OECD average 14%.**

During the years spent studying at university there is the greatest opportunity to not only impart technical skills but also to influence, shape, and refine a student's overall behavioural competencies.

An allied issue is that of the quality and performance outcomes of undergraduate students. The combination of high student /staff ratios, less funding per student, high international student percentages, research emphasis at the expense of teaching, and too much part-time student work all contribute to less course time, less laboratory activity, less effective tutorials with consequent risk to outcome quality and performance standards.

## 2 The need to improve the quality of teaching of mathematics and science in our schools.

There is ample evidence of the decline in numbers of good quality mathematics and science teachers in Australian secondary schools. This is a contributing factor to the issue in Item 1. Action needs to be taken to incentivise teachers by way of tangible rewards and recognition to undertake appropriate or additional studies to redress this problem, and also to remain teaching rather than taking higher paid administrative positions.

## 3 Stronger support for the vital role of Australian research in innovation.

There needs to be much greater investment in research infrastructure at Australian universities. In too many instances our laboratories are far from world standard and in some instances incredibly dated and inadequate. The Higher Education Endowment Fund (HEEF) will provide only a fraction of the funds needed for capital works. (It is less than 20% of the endowment of Harvard University). It needs to be at least \$20 billion. Then it may have some real impact.

#### 4 The need to increase our investment in R& D.

Investment by business and industry in R&D in Australia is close to the lowest in the OECD. The total investment (government and private) in R&D is low by international standards, at about 1.8% of GDP and stagnant, compared with 4% in Israel, 3.9% in Sweden, close to 3% in the US, and over 2% and rising in Canada and Japan. The Lisbon declaration also committed the EU to a target of 3% of GDP. The low level of investment by the private sector, less than 1% in Australia compared with say 3% in Sweden, is of particular concern. For a nation that should be globally competitive this is a major failing. It is interesting to note that in Australia we have around six researchers per thousand workers and in Sweden they have twice that number (in Finland they have nearly three times the Australian number).

#### 5 Adequate funding to position Australian universities at the leading edge of knowledge creation and diffusion.

The level of investment by the federal government in universities has fallen by about 30% per student in the past decade. Only an average of 40% of the income of Australia's public universities now comes from government. At the same time academic staff/student ratios have worsened from 1:14 to 1:20. In the US for example at Washington University in St. Louis they are 1:2, at University of Michigan 1:9, at state universities such as Illinois, Massachusetts, and Minnesota 1:14, while top-line institutions like , Harvard, Stanford, and MIT are 1:4 or 5, in India at the Indian Institute of Technology 1:9, in China at Sichuan University (60,000students) 1:10. This is a fundamental challenge which underpins the whole issue of quality teaching and learning.

#### 6 The need to develop more inclusive interdisciplinary approaches to research and collaboration.

Many of the major challenges facing us require interdisciplinary approaches and existing barriers need to be breached to enable more effective collaboration amongst all stakeholders- between the public and private sectors, between research organisations and research beneficiaries, between business and universities, and between governments.

#### 7 We need to create more of a demand driven research culture.

Much of the research in Australia is supply driven. We create solutions looking for a problem (in terms of commercial outcomes). We constantly discuss the "commercialisation of IP out of universities". Innovative companies and innovative individuals need more encouragement and support. In Australia, SME's deserve and need special attention in this respect. For example, the patent system as it applies to SME's should be simplified and made less costly.

There has been growing attention in recent times to the *Third Mission* of universities and the *idea of engagement* between universities and society. The Third Mission complements the mission of teaching and the mission of research.

Communities Engagement has a broad vista that extends beyond business and economic aspects. Universities have a wider view of engagement which includes social, economic, environmental and cultural dimensions of capacity building. Universities make contributions to government and civil society as well as the private sector, assisting not only with economic performance but also helping to improve quality of life and the effectiveness of public service.

There already exists in universities varying levels of engagement through teaching and research. Universities already engage with and add value in partnership with industry, and can demonstrate

significant contributions to regional capacity building. The commercialisation of the Intellectual Property (IP) owned by universities is but one example of engagement through research. A priority in this commercialisation process should be the creation and nurturing of Australian based businesses.

Engagement should also have a two-way orientation, with institutions outside higher education committed to interactions with universities in a similar way.

This two-way relationship is one in which the university forms partnerships with communities that yield mutually beneficial outcomes such as:

- Productive research outcomes that are, among other things, socially robust;
- Regional economic growth;
- Addressing social and environmental issues in the community;
- Linking the community and the world (boosting local/global connectivity);
- Social capital development;
- Progress towards a region's sustainable development;
- Human capital development;
- Development of corporate and private citizenship attributes;
- Driving social change including helping to solve some social issues especially in areas of disadvantage; and
- Development of the cultural and intellectual fabric of the community.

In practice *Third Mission* activities of universities seek to generate, apply and use knowledge and other university capabilities outside academic environments. At the same time, policy makers, industry leaders, business executives, and NGO managers understand the importance and contribution of scientific and humanitarian knowledge to innovation, resolving complex problems, and developing opportunities for productivity and performance improvement. These groups seek to draw on the distinctive capabilities of universities as co-creators of industrially, socially and environmentally relevant and applicable knowledge and in the application of it. These relationships could be significant drivers in creating a much more demand driven research and innovation culture.

#### 8 Government programs need to be more targeted and focussed.

The number and complexity of government programs designed to support innovation is a veritable jungle, impenetrable by all but the most determined and experienced. The sheer difficulty of accessing programs deters thousands of potential innovators- companies and individuals. R&D Tax Concessions need to be reviewed to make them more conducive to pursue research. The Australian tax concession was introduced at 150%. Immediately, and for a number of years thereafter, business R&D grew. Since the introduction of the 150% tax concession, successive governments have significantly diminished its value, and in doing so have greatly reduced the incentive to undertake R&D: by lowering of the corporate tax rate; reducing the concession to 125%; introducing dividend imputation; and increasing compliance costs. To be attractive the rate needs to be at least 200%.

In the arena of taxation, ESOP's (Employee Share Option Plans) have been identified as an effective way of rewarding employees but the Australian taxation system is not conducive to this.

There needs to be much more focus on commercialisation rather than on R&D. Government grants and concessions in Australia tend to focus on innovation and R&D and neglect commercialisation, which is the most costly and difficult phase of the innovation spectrum.

Australia is good at inventing, but poor at turning the ideas into commercial products and services. Government procurement programs should support Australian innovation. The enormous funds sitting in superannuation could be imaginatively used to support innovation.

9 Extending our horizon beyond the physical sciences

Service industries are an important and growing sector of our economy. In a similar vein the humanities and social sciences are often neglected when we speak of innovation. We need to adopt a broader view of the potential and application of innovation.

10 A focus on emerging areas of national importance to Australia

It would seem to make sense, in an environment of scarce and limited resources, to focus our attention on challenges of national importance, such as water, the ecology, an ageing population, energy, and infrastructure. These priorities would need to be reviewed from time to time.

11 The importance of measurement.

An aspect often overlooked is the importance of knowing how successful or otherwise various initiatives have been. There needs to be, therefore, metrics put in place to help policy makers gauge the worth or otherwise of programs and so on.

12 We are in a global world.

We urge the Panel to take advantage of and learn from the very valuable and useful work (reviews, reports, programs, etc.) that has been done in recent years around the world in the innovation space.

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