Australian Government

OFFICE OF THE CHIEF SCIENTIST

Top Breakthrough Actions for Innovation

PMSEIC, DECEMBER 2012

At the previous PMSEIC meeting, it was agreed that the Chief Scientist would bring to the next meeting advice on breakthrough actions that governments could take to enhance innovation in Australia.

The Office of the Chief Scientist (OCS) wrote to 63 organisations, peak bodies and individuals seeking their answer to the question:

> *What are the top breakthrough actions that the Commonwealth and state/territory governments, research agencies, universities and the business community can take to utilise fully Australia's substantial research capability to contribute to national productivity growth through innovation?*

Organisations approached included federal government departments, the Business Council of Australia (BCA), Australian Industry Group (AIG), science and research agencies and the learned academies. For a full list, see page 10.

Scale is paramount when considering the proposed breakthrough actions. There are many support or incentive programs that are current and many more that have been tried over decades - all focussed on the same question. Many of them would be classed as useful; hardly any as bad. Yet we continue to have the discussion that began all those years ago. An issue for us is not effort, but scale.

For example, our proposed Breakthrough Action 5: on workplace opportunities for STEM students; is already in place in a number of universities, but the scale is small. If we are to provide students with a taste of working in business and industry; if we are to encourage education providers to design programs that enable graduates to work easily and willingly in many different sectors of the economy; and, if we are to change the prevailing cultures, we need scale. Accordingly, we suggest that 50 per cent of the 56 000 incoming STEM undergraduates should expect a semester-long work-related placement or project for credit as part of their course.

In the past there has been a sense of incrementalism. It was probably safer.

Now, we need to do things differently. Of course, we should be aware of risks, assess them and manage them. But we will not be able to avoid them. By doing more of the same, with a change at the margins, we run a very real risk that we will be back again in twenty years asking the same question.

The five breakthrough actions that we have proposed seek to do things differently and to add scale. Properly detailed they could be the ideas that change our innovation landscape.

Our proposals are examples of what could be done, and all have wide support. The details need to be worked out; and doubtless, more consultation will be needed; but the core ideas are presented for consideration.

The top breakthrough actions that are required are as follows:

1. ESTABLISH AN AUSTRALIAN INNOVATION COUNCIL

It is proposed that Government establish an Australian Innovation Council.
The Council would have responsibility for strategy, funding programs, assessing capacity in both innovation and related R&D; and advising Ministers through the Australian Research Committee (ARCom). It would work with research funding agencies to harmonise relevant effort.

2. STRENGTHEN BUSINESS ACCESS TO PUBLICLY FUNDED RESEARCH EXPERTISE, INFRASTRUCTURE AND DATA

Business must have open access to publicly funded expertise, infrastructure and research data, especially in areas of national priority. To facilitate access to skilled personnel and infrastructure, the Commonwealth should establish a National Innovation Voucher pilot program.

3. ENCOURAGE MOBILITY OF RESEARCHERS BETWEEN ACADEMIA AND BUSINESS OR OTHER ENTERPRISES

Policies need to ensure that researchers are encouraged to engage with areas where academic publications are not the primary focus, and are not disadvantaged in academia as a result.

4. HARMONISE IP FRAMEWORKS ACROSS THE PUBLICLY FUNDED RESEARCH SECTOR

Arguments about IP are a major obstacle in potential researcher-industry partnerships. IP policies among publicly funded research organisations should be standardised and simplified to foster collaboration within and between sectors.

5. EMPHASISE THE ROLE OF STEM EDUCATION IN CHANGING THE CULTURE

The Commonwealth should influence educational outcomes and through that the prevailing culture in science, technology, engineering and mathematics (STEM), by significantly expanding opportunities for work placements for STEM students.

ESTABLISH AN AUSTRALIAN INNOVATION COUNCIL

Breakthrough Action One

The National Research Investment Plan (the Plan), endorsed by Government on 29 October 2012, states that:

> *"Australian Government investment in enabling capability, and the fundamental elements of the national research fabric, should be more closely integrated with business research and the business sector's needs for innovation to support productivity growth."*

PROPOSAL

It is proposed that Government establish an Australian Innovation Council.

The Council would comprise business and enterprise leaders, have funds to allocate, and work with the Research Councils on shared funding priorities as required.

The Australian Innovation Council would:

- identify areas of market demand for innovation in goods and services;
- catalyse innovation in these areas - particularly those linked to societal challenges;
- help to ensure that some publicly-funded research is directed at user needs;
- support the translation of research outcomes into marketable goods and services;
- provide focus and links between the research sector and enterprise innovation to improve goods, services and know-how;
- consolidate existing programs e.g. Enterprise Connect, Commercialisation Australia, Cooperative Research Centres (CRCs), AusIndustry programs, and others; and administer them using the existing infrastructure and expertise of the programs; and
- develop international links to both markets and know-how.

The Council would subsume the advisory functions of the Innovation Australia Board.

The Council would enable the business and enterprise sector to identify areas of innovation on which it should focus particular attention. Some areas would contribute explicitly to meeting elements of the 'societal challenges' while others may recognise priorities for Australian business alone.

The Council would assess Australia's capacity to deliver innovation to national and international markets, and the capacity of R&D to contribute in relevant areas as needed.

FUNCTION

The Council would directly allocate and manage public funding for enterprise-led innovation and leverage contributions from end users.

The Council's operation would include consideration of a set of government-endorsed societal challenges.

Within each societal challenge, two to three innovation priority areas would be identified, subject to revision every two years. Any revision would build on the previous set of priorities enabling a steady but manageable evolution in the funding profile that mitigates emerging gaps and captures new opportunities.

Innovation priority areas would be approved by the Council based on recommendations from expert working groups drawn from business, research and government.

Innovation priority areas would be those where a critical level of activity is required. The activity may not be geographically constrained. Decisions would recognise that many areas are important, however, at a given time, there will be some more important than others.

Selection criteria for innovation priority areas would consider the capacity of enterprises to take the innovation to market or put to use; give weight to an activity that has strong opportunities for possible future innovation; and examine the quality and capacity of R&D needed to support further innovation. Part of the assessment will be based on Australia's capacity to deliver outcomes - whether we have the desired 'critical mass' to develop and exploit the innovation.

As part of this process, the Council would work with the Australian Research Committe (ARCom) to identify gaps and deficiencies in Australia's national capacity and capability across the priority areas.

Within each innovation priority area funding priorities would be identified and recommended by the same expert working groups for approval by the Council.

Funding priorities would describe where Government-leveraged investment in enterprise-led innovation is, or should be directed to.

National Research Investment Plan principles will be used to assess Australia's capacity to deliver on the Innovation Priority Areas. Factors to be considered include the research workforce, infrastructure, and current funding levels. This will enable an assessment of whether, how and where capacities need to be developed or maintained.

The Council would work cooperatively with the Research Councils and share responsibility for initiatives that encourage business and enterprise research collaboration.

The Council would make recommendations on the allocation of PhD places and scholarships in particular areas of identified priority.

SPECIFIC ACTIONS

- Establish the policy framework for the Australian Innovation Council.
- Appoint a business-led Australian Innovation Council to define innovation priority areas and funding priorities.
- Provide the Council with consolidated resources to allocate.

EXAMPLE

Undertaken by:

STEP 1:

Societal Challenges

3

MANAGING OUR FOOD AND WATER ASSETS

Australian Government

STEP 2:

Innovation Priorities

I 3.1

SUPPLY EMERGING MARKETS

I 3.2

ADVANCED AGRICULTURAL PRODUCTION

Expert Working Group, endorsed by Australian Innovation Council

STEP 3:

Capability and Capacity Mapping

MAP FOR I 3.1

MAP FOR I 3.2

Australian Innovation Council with Australian Research Committee

STEP 4:

Funding Priorities

I 3.1.1

UNDERSTANDING FOOD DEMAND IN THE ASIAN CENTURY

I 3.1.2

ADVANCED FOOD PACKAGING AND PROCESSING

I 3.2.1

RESILIENT CROPS AND LIVESTOCK BREEDS

I 3.2.2

NUTRITIONALLY ENHANCED AND FUNCTIONAL FOODS

Australian Innovation Council

STRENGTHEN BUSINESS ACCESS TO PUBLICLY FUNDED RESEARCH EXPERTISE, INFRASTRUCTURE AND DATA

Breakthrough Action Two

RATIONALE

Business must have increased access to publicly funded expertise, infrastructure and open-access to research data, especially in areas of national priority.

Improved access to public research sector resources should increase capacity to improve products, services and processes. It should also help business and service providers to identify what they don't know.

This is particularly important for small to medium-size enterprises (SMEs), which can lack the in-house resources required to innovate, or the ability to gain ready access to the expertise, infrastructure or data they need.

PROPOSAL

To facilitate access to skilled personnel and infrastructure, the Commonwealth should establish a National Innovation Voucher pilot program.

To identify where and how to invest the publicly funded vouchers, the Commonwealth should establish a group (flying squad) comprising 20 pairs of recent STEM PhD and MBA graduates charged with establishing links between SMEs and research organisations.

A National Innovation Voucher System:: The vouchers would provide funding for two purposes:

- to enable business to access a range of solutions from the public research sector through expertise, infrastructure or data; and
- to provide access to expertise to develop business plans for future innovation.

A flying squad of recent STEM PhD and MBA graduates: Their role in teams of two would be to work with an SME for no longer than a month to identify where the SME could improve their products or services. They would help design a program, identify where the relevant technical or business expertise lay, and build the bridge between the SME and the research sector should that be needed. After an evaluation by the Council, the voucher should be used to cover some of the costs involved.

SPECIFIC ACTIONS

- Establish a policy to pilot a National Innovation Voucher system.
- Enable business to use the vouchers to access innovation expertise (including that leading to business plan development), as well as research expertise and publicly funded infrastructure.
- Deploy collaboration-focussed flying squads of new PhD and MBA graduates to participate in short-term projects as part of business innovation activities.
- Provide free and open access to data and other outputs of publicly funded research.

ENCOURAGE MOBILITY OF RESEARCHERS BETWEEN ACADEMIA AND BUSINESS OR OTHER ENTERPRISES

Breakthrough Action Three

RATIONALE

Current incentives for researchers mostly favour work directed towards high quality academic publications. Researchers can be discouraged from engagement where academic publications are not the primary focus, as their career paths can be adversely affected by absences from academia.

Mobility between sectors is an internationally recognised mechanism for reducing the cultural barriers that have historically prevented interaction between the business and research sectors.

Action needs to be taken to reward exchanges between researchers and users of their expertise, and minimise disincentives to mobility.

PROPOSAL

The Commonwealth should expect publicly funded councils, agencies and universities to develop policies that encourage staff to undertake 'exchange' arrangements with business and service providers, and ensure that these staff are not disadvantaged when they return to the research sector.

Research organisations should also develop policies that welcome staff from business into the research enterprise.

Research organisations should use additional measures of performance, based on collaborative activities, as elements in internal promotion and performance criteria.

Recognising the value of such work in future grant applications should offset any reductions in academic output, mitigating the career risk of spending time outside the research or university sector.

Barriers to mobility between the business and research sectors are established early. Work experience opportunities should be provided to postgraduate students through internships, cadetships and fellowships.

SPECIFIC ACTIONS

- Liaise with research institutions receiving public funds to ensure that their policies support researchers engaging with business.
- Restructure PhD education to include internships, commercial fellowships or cadetships within the business sector.

HARMONISE IP FRAMEWORKS ACROSS THE PUBLICLY FUNDED RESEARCH SECTOR

Breakthrough Action Four

RATIONALE

Arguments about intellectual property (IP) are a major obstacle in potential researcher-industry partnerships, because each institution takes its own policy to the table and defends it. These policies are often complex and inconsistent.

Setting IP policies requires a balance between market exclusivity and opening access.

Standardisation of IP policies among publicly funded research organisations is a mechanism for fostering collaboration within and between sectors. For example, the UK's Lambert IP Toolkit consists of a set of five Model Research Collaboration Agreements for universities and companies that wish to undertake collaborative research projects.

PROPOSAL

The Commonwealth should require a standardised and simplified IP policy framework covering publicly funded research agencies, departments and universities.

The framework should build on the best aspects of current IP policies.

The Commonwealth's own approach to IP should comply with the standardised policy.

SPECIFIC ACTIONS

- Establish consistent principles and model contract templates for the management of IP across public research organisations.
- The Commonwealth IP policies should also be reviewed and made consistent with those emerging from research organisations.

EMPHASISE THE ROLE OF STEM EDUCATION IN CHANGING THE CULTURE

Breakthrough Action Five

RATIONALE

STEM education must provide for a range of career options, including within the academic, business and government sectors.

The Commonwealth should influence educational outcomes and through that the prevailing culture in science, technology, engineering and mathematics (STEM) fields - in education and in business.

Programs that allow undergraduate STEM students to undertake business placements and work on business-related research projects would give them direct experience of the workplace and valuable additional skills, while they add value to the workplace.

Improving the relevance of a STEM education should encourage greater STEM uptake at undergraduate level.

PROPOSAL

The Commonwealth should require every Australian STEM degree course to provide an opportunity for a substantial number of students to undertake a business placement or project for university credit to the value of one full-time semester. These could be either domestic or international placements.

For example, it is already an institutional accreditation requirement of Engineers Australia that all engineering degrees include a 12-week 'Exposure to Engineering Professional Practice' component. This is an important start; but to change the culture, we have to change the scale of these initiatives across the broad range of STEM subjects.

At least 50 per cent of STEM undergraduate students should complete a work-related placement or project during their course. In 2010, there were 56 000 commencing STEM students; this suggests about 25 000 – 30 000 students would engage with business each year.

STEM PhD students should be provided with targeted opportunities to explicitly strengthen generic skills such as communication, teamwork, and project planning, and business skills such as commercialisation, intellectual property and financial management.

SPECIFIC ACTIONS

- Provide opportunities for business placements and projects in all STEM degree courses.
- Increase teaching of generic and business skills in STEM PhD programs.

Notes

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BREADTH OF CONSULTATION

There were 65 written responses offering a wide range of opinions, with many presenting consistent themes and issues. These have been distilled down to the five most significant actions that would lead to a change in what we do in Australia. They were then work-shopped and discussed over several weeks. Face-to-face consultations involved internal discussions with relevant DIISRTE line areas, including the Innovation Division, the Science and Research Division and Enterprise Connect. External meetings were held with BCA, AIG, the Australian Curriculum, Assessment and Reporting Authority (ACARA); and other groups such as the publicly funded research agencies and individuals including the CEOs of the ARC and the NHMRC and the Chair of the Innovation Australia Board. Less formally, there have been meetings with Vice Chancellors and others in the research community. The Chief Scientist also visited colleagues in Washington DC, London, Brussels and Bonn. The proposed breakthrough actions have been heavily influenced by all of the consultations.