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Vice-Chancellor and Principal

21 March 2016

Mr Andrew Laming MP
Chair
House of Representatives Standing Committee on Education and Employment
Parliament House, Canberra Act 2600

By email: ee.reps@aph.gov.au

Dear Mr Laming

Inquiry into innovation and creativity: workforce for the new economy

The University of Sydney is pleased to provide the **attached** brief submission to your Committee's inquiry into the capacity of Australia's tertiary education system to meet the needs of a future labour force focused on innovation and creativity.

We look forward to assisting the Committee with its inquiry.

Should you require any further information from the University of Sydney, in the first instance please do not hesitate to contact Mr Tim Payne, Director, Higher Education Policy and Projects in my office: tim.payne@sydney.edu.au, 02 9351 4750.

Yours sincerely

Signature removed for electronic distribution

Michael Spence

Attachment University of Sydney Submission to the House of Representatives Education and Employment Committee's inquiry into innovation and creativity: workforce for the new economy, March 2016

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University of Sydney submission to the House of Representatives Education and Employment Committee's inquiry into innovation and creativity: workforce for the new economy, March 2016

Executive summary

Australia's future prosperity will depend on the nation's capacity to diversify the economy by developing new industries in sectors where we can build a competitive advantage.

With predictions that technology will make more than 5 million existing lower-skilled Australian jobs redundant in the next decade or so, our entire system of education needs to be strengthened, if we are to equip our young people with the high-level skills and attributes they will need for success in a rapidly changing global economy.

Universities must play an important part in meeting the challenge. However, their capacity to contribute depends to a large degree on the quality of the 'pipeline' of students produced by our schools and vocational education systems.

Unless we can lift pre-tertiary learning outcomes – particularly in the STEM disciplines and in second-language acquisition – we risk leaving many millions of people behind both economically and socially. If this occurs it is likely that there will be significant budget implications for future governments due to reduced economic growth, and higher welfare, health and other costs.

Regrettably Australia's current complex federated model of education falls well short of what is needed if we are to be globally competitive. Various recent reviews have highlighted the fundamental structural and funding problems that must be addressed if significant improvements in student learning outcomes are to be achieved from our school, vocational and higher education systems.

The Gonski Review, the Reform of the Federation Process's education issues papers, and various recent reviews of the higher education system set out the challenges clearly. They also point the way in terms of the types of policy solutions that are required if long term improvements are to be made.

Meanwhile, the University of Sydney has been doing all it can – within the constraints imposed by current regulatory and funding arrangements for university teaching and research – to provide the highest quality educational experience possible for our students across all programs.

We are aware of the pace of technological and workplace change, and are constantly reviewing our programs, as well as our approach to industry engagement, knowledge transfer and research commercialisation. We currently have ambitious plans to transform our generalist, professional and higher degree by research programs to strengthen them further over the course of our 2016-20 Strategic Plan**.**

We are concerned, however, that the current regulatory framework under which Australian universities operate is far from optimal, in terms of the extent to which it encourages and supports innovation, provides for equity of access, and creates diversity by freeing institutions to pursue distinctive missions.

ToR 1 - The extent to which students are graduating with the skills needed for today and the future

Context

Debate about the value and usefulness of a university degree is not new or unique to Australia. A quick scan of the internet will reveal that similar questions have been raised over many years in countries with mature tertiary education systems. Whether in North America, the United Kingdom, Europe, Asia or Australia, university educational programs are regularly criticised as irrelevant and failing to produce graduates with the knowledge, skill and attributes needed by the economy and workplaces of today, and of the future.

While our assessment is that such criticisms are often not well supported with evidence, we acknowledge that there is no room for complacency. The scale and pace of workforce change that is occurring today is arguably greater than at any point since the start of the industrial revolution. However, a key difference today, compared to other phases of the industrialisation process, is that whereas in the past technological advances have tended to offset job losses through the creation of new opportunities, the rapid computerisation of many tasks today threatens to render obsolete entire fields of work on which many millions of people currently rely.

As outlined below, like many Australian and international universities, the University of Sydney is well aware of the challenges that the economy and society face. We are rethinking our graduate qualities, and redesigning our curriculum and approach to education to strengthen the skills and attributes of our students. A key element of our strategy involves working hard to strengthen our partnerships with industry, government and community organisation in Australia and overseas, to create opportunities for our students for quality work-integrated learning experiences.

OECD employment trends

Global economic uncertainty following the GFC, the sheer pace of technological change, and the growth in graduate numbers in Australia and elsewhere has brought a healthy renewed interest and focus on the quality and relevance of tertiary education systems. It is worth noting, however, that across the OECD, on average:

- 80% of tertiary-educated people are employed, compared with 70% of people who complete secondary school, and less than 60% of those who do not complete school;
- adults with a tertiary degree earn 60% more than adults who only complete secondary school;
- people with a master's or doctoral degree have the highest earning advantages;
- the gross earning benefit for individuals with a tertiary qualification over the course of a lifetime are US $477,500 for men and US $332,600 for women; and
- the net public return on investment in tertiary education is 2.5 times the public cost for males, and 1.2 times for females.[1]

Australian employment trends

According to the Reserve Bank of Australia there are two standout trends where Australia's jobs growth has occurred over the last twenty five years. First, by far the largest gains have occurred in positions that require high level qualifications. Second, the bulk of Australia's new jobs have come in the service industries. More than 3.5 million positions have been created in these sectors since the early 1990s, compared to just over 500,000 in the goods producing industries (manufacturing, mining, construction etc). These new services jobs requiring high level qualifications have been created largely in the health, education, community and personal services, retail, finance, engineering, information technology, software design, telecommunications and tourism sectors etc.[2]

Australia is a high wage country with an ageing population. With the next wave of economic growth predicted to come from industries such as gas, agribusiness, tourism, education, health and financial services, strong demand for people with high level tertiary qualifications looks certain to remain a feature of Australia's economy for the foreseeable future.[3]

[1] OECD (Nov 2015), *Education at Glance 2015: OECD Indicators*, pp. 92-133
[2] Philip Lowe, Deputy Governor, Reserve Bank of Australia (Nov 2014) *Address to the Australian Business Economists (ABE) Annual Dinner*
[3] Deloitte (2014), *Positioning for prosperity: catching the next wave*

Workforce of the future

Philip Lowe, Deputy Governor of the Reserve Bank, has argued recently that Australia's future competiveness and prosperity will depend on:

- our national capacity for high-level cognitive skills and the ability to understand and solve complex problems;
- having people who are curious, able to grasp new opportunities, and able to transform and interpret information in new ways using new technology;
- the strength of our workforce's interpersonal skills to provide the premium services that will attract premium prices in the global marketplace; and
- on our national capacity to develop a culture that promotes and rewards creativity, flexibility, innovation, excellence, entrepreneurship and risk taking.[4]

Meanwhile, the excellent *Australia's future workforce* report released by the Committee for Economic Development of Australia (CEDA) in June 2015 predicted that almost 40%, or 5 million, Australian jobs face a high probability of being replaced in the next decade or two as a result of technological advances, with another 20% of roles facing a medium probability of redundancy. The report predicted that jobs that involve low levels of social interaction, low levels of creativity, or low levels of mobility and dexterity are most likely to be replaced by computer technology.

CEDA's report made four key recommendations relevant to the tertiary education sector, and with which we agree:

- develop a unified, overarching policy framework to guide the allocation of investment in education and training from early childhood to tertiary education;
- ensure all stages of the education process focus on instilling competencies rather than the retention of specific knowledge;
- examine extending the formal education system to include a public learning-focused childcare and preschool system as an affordable part of the early education package; and
- establish digital literacy as a basic competency for all workers in the future.[5]

Preparing our students for success

Comprehensive comparable data about the quality of tertiary student learning outcomes and their generic employability skills unfortunately remain limited in Australia. Better data are available in other countries. For example, a recent influential study found that contemporary US university students are making relatively small gains in skills for critical thinking and writing - smaller gains than those of students assessed in prior decades.[6] A follow-up to the same study demonstrated that low gains in skills obtained during university translated into poor employment outcomes thereafter.[7] These findings, together with other evidence that the trajectory of learning established during university continues on a similar course after university, underlines the vital importance of ensuring substantial gains in capabilities over the course of studying for a degree.[8]

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[4] Ibid.
[5] CEDA (June 2015) *Australia's future workforce*, p.8
[6] Arum, R., & Roska J. (2011), *Academically Adrift: Limited Learning on College Campuses, Chicago,* University of Chicago Press
[7] Arum, R., & Roska J. (2014), *Aspiring Adults Adrift: Tentative Transitions of College Graduates,* University of Chicago Press
[8] Pascarella, E.T., & Terenzini, P.T. (2016), *How College Affects Students, Volume 2: A Third Decade of Research*, San-Franscisco: Jossey-Bass.

Like many universities, we are currently giving much thought and effort to ensure that our students do make strong learning gains throughout their studies.[9] We predict that to contribute effectively in today's rapidly changing world, university graduates will not only need deep disciplinary knowledge, but well-developed skills for critical thinking, problem solving, communication and teamwork. They will also need the capabilities for independent research, and lifelong learning for updating their knowledge, and skills for information literacy. Moreover, they will benefit from foreign language acquisition, and from developing the flexibility and breadth of perspective necessary to interact productively and creatively across cultural, disciplinary and professional boundaries. They will need, too, the personal resilience to deal with uncertainty and failure, and the sureness of personal values and clarity of social purpose to make ethical responses to whatever challenges confront them in their workplaces and communities. To these ends we are developing and implementing the following new set of qualities for our graduates, and renewing our degree and curriculum framework to yield these qualities:

Graduate qualities	**Purpose**
Depth of disciplinary expertise	To excel in applying and continuing to develop disciplinary expertise
Broader skills: - critical thinking and problem solving - communication (oral and written) - information/digital literacy - inventiveness	To increase the impact of expertise, and to learn and respond effectively and creatively to novel problems
Cultural competence	To work productively, collaboratively and openly in diverse groups and across cultural boundaries
Interdisciplinary effectiveness	To work effectively in interdisciplinary (including inter-professional) settings, and to build broader perspective, innovative vision, and more contextualised and systemic forms of understanding
An integrated professional, ethical and personal identity	To build integrity, confidence and personal resilience, and the capacity to manage challenges and uncertainty
Influence	To be effective in exercising professional and social responsibility and making a positive contribution to society

University of Sydney, *Developing a distinctive undergraduate education, Strategic Planning for 2016-20, Discussion Paper No.1, p.10 June 2015*

Many of our programs already include very strong work-based learning components as compulsory or voluntary options for students. For example, students in our health disciplines complete more than 280,000 clinical placement days in the NSW public health system each year. We will be working with our private, government and community sector partners in Australia and internationally to enhance work-integrated learning opportunities for our students. Increasingly, this will include programs enabling students to develop entrepreneurial skills, and giving students opportunities to work in interdisciplinary teams on real world problems identified as priorities by our industry partners.

[9] See for example, University of Sydney (June 2015), *Towards a distinctive Sydney education: a discussion paper*, October 2014 and University of Sydney, *Developing a distinctive undergraduate education, Strategic Planning for 2016-20*, Discussion Paper No.1.

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Measuring employer satisfaction with Australian university graduates

In 2014 the University of Sydney's Workplace Research Centre led a pilot project for the Commonwealth Government to develop Australia's first regular survey of employer satisfaction with the generic and technical skills of university graduates. Following a comprehensive domestic and international literature review, the pilot developed the following conceptual framework around which a model survey was developed and tested:

- foundation skills (including oral and written communication skills, problem solving);
- adaptive capacity (including ability to learn and work independently and recognise diverse perspectives;
- teamwork and inter-professional skills (capacity for cooperation and collaboration, and capacity to get on well with colleagues and co-workers);
- technical skills and domain-specific knowledge (including use of information technology); and
- employability skills (ability to meet deadlines, be flexible and adaptable, cope with work pressures and stress).

While the ESS will not be run nationally until 2015-16, the pilot's analysis of graduate and supervisor interviews indicated that:

- overall, both graduate and supervisor respondents gave very positive feedback about the degree to which university qualifications prepare graduates with the range of technical and generic skills required in the graduate labour market;
- the most highly rated skills clusters were teamwork and interpersonal skills, foundation skills, and adaptive skills; and
- very consistently, supervisors rated their graduates' qualifications even more highly than the graduates themselves.[10]

Once the ESS is established, the data it produces will be added to the Australian Government's Quality Indicators for Learning and Teaching (QILT) website, alongside information from the longstanding Student Experience Survey (SES), Course Experience Questionnaire (CEQ), and Graduate Destination Survey (GDS).[11] If it is well designed and well resourced, the ESS has the potential to be a useful source of longitudinal information, and a tool for governments, regulators and accrediting bodies, education providers, employers and students.

ToR 2 - Matters relating to laws and regulations that may act as a barrier to education providers being able to offer qualifications that meet the needs of the new economy and fastest growing sectors.

We raise the following six key areas of regulatory challenge that we believe are holding Australia's universities back from offering qualifications that produce graduates equipped with the knowledge, skills and qualities demanded by the new economy.

1. Improving pre-tertiary learning outcomes

The capacity of Australia's tertiary education sector to deliver the graduates needed by the new economy, and fastest growing sectors, depends to a large extent on the basic competencies of the 'pipeline' of students coming through our school and vocational education systems. Taken together, the Gonski Review and the Education Issues papers released as part of the Reform of the Federation White Paper process, provide a comprehensive picture of

[10] Workplace Research Centre (June 2014), The University of Sydney, *Employer Satisfaction Survey, Report for the Department of Education*

[11] Quality Indicators for Learning and Teaching: https://www.qilt.edu.au/about-this-site/employer-satisfaction-survey-(ess)

how and why our complex federated approach to regulating and funding pre-tertiary education is failing to produce internationally competitive learning and skills outcomes.[12] As the Gonski Review recommended, available resources needs to reflect actual efficient costs of delivering education to a desired standard, with additional funding allocated on the basis of the level of disadvantage of the community serviced by each school. Meanwhile, the Reform of the Federation's Education Issues papers made a compelling case for clarifying responsibilities and accountabilities for delivering student learning outcomes between the Commonwealth, and the state and territory governments.

2. STEM skills

With estimates that as many as 75% of the fastest growing occupations require skills and knowledge in the science, technology, engineering and mathematics fields, declining school enrolment trends in these disciplines in Australia has been recognised as a major challenge for at least a decade.[13] The continuing downward trend in the proportion of secondary students completing higher level mathematics courses is of particular concern to the University of Sydney. We have recently taken steps to try to help halt the decline. In February 2016 we announced that from 2019 students applying for many of our courses must achieve the equivalent of a Band 4 in a NSW HSC Mathematics course higher in difficulty than General Mathematics.[14] The National STEM School Education Strategy recently agreed by Commonwealth, State and Territory Education Ministers is a very welcome development, as is the release by the National Academy of Science of a National Decadal Plan for the Mathematical Sciences.[15]

3. Languages other than English skills

As Australia's economy and society becomes increasingly integrated with Asia, business will increasingly be conducted in the languages of the growing Asian powers, and be shaped by their cultural preferences. As the third most monolingual developed nation, Australia's relatively low levels of second-language proficiency puts us at risk of failing to capitalise on opportunities arising in Asia and elsewhere.[16] Unfortunately, past attempts at a national approach to lift language proficiency (particularly for Asian languages) have failed to deliver substantial improvements. This is due to a lack of long-term bi-partisan commitment, supported by adequate funding starting at the primary school level if not before, with clear responsibilities and accountabilities for delivering outcomes. There is a need for a renewed, long-term national approach to addressing Australia's language skills deficit, but this requires strong bi-partisan leadership from governments at all levels, as well as strong coordination through COAG.

4. Regulation of higher education teaching

The regulatory and funding challenges facing Australia's higher education system have been the subject of many incremental policy changes since the Hawke Labor Government's *Unified National System* reforms of the late 1980s. We have contributed to the many reviews and inquiries into the system that have occurred over the last decade or more, making our position clear on the types of reforms needed to ensure that our universities can remain internationally competitive.[17] In relation to the delivery of university education programs, our basic position

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[12] Gonski D., et al. (2011), *Review of Funding for Schooling*: https://federation.dpmc.gov.au/publications

[13] AiGroup (2012), *Lifting our Science, Technology, Engineering and Maths (STEM) Skills*

[14] Kennedy J., Lyons T, Quinn F, (June 2015) *The continuing decline of science and mathematics enrolments in Australian high schools, Teaching Science Journal*, Volume 60, No 2

[15] https://www.aisnsw.edu.au/Services/EducationResearch/Latest%20Research%20Documents/National%20STEM%20School%20Education%20Strategy.pdf ; https://www.science.org.au/news-and-events/news-and-media-releases/new-ten-year-plan-mathematics-be-launched-today

[16] Griffith University, Australian Strategy for Asian Language Proficiency, https://www.griffith.edu.au/australian-strategy-asian-language-proficiency/report/key-principles

[17] Department of Education and Training (2015), Higher Education in Australia, a review of reviews from Dawkins to today: https://docs.education.gov.au/node/38481; For the University of Sydney's recent inputs to policy processes see: http://sydney.edu.au/about/government/submissions_2016.shtml

remains unchanged from the opening statement in our submission to the Review of Base Funding conducted in 2011:

> "*the current cluster funding framework (based as it is on the Relative Funding Model – RFM – established over twenty years ago) has passed its use by date. We do not believe that further tweaking or short term fixes to the current arrangements will be sufficient to underpin in the long term a high quality Australian higher education system.*"[18]

For 25 years incremental adjustments have been made to the disciplinary funding clusters, loadings and student contribution amounts to address perceived weaknesses, anomalies and skills shortages in particular areas. While the original funding amounts bore little relation to actual costs, the nature of educational delivery and associated costs have changed dramatically over time – not least because of the advent of the computer age and increases in salaries.

The resulting irrationality, inconsistency and lack of transparency of the funding arrangements, combined with the introduction the demand-driven funding in 2012, has led to a range of responses from providers that were predicted by the Base Funding Review. Domestic student enrolments have increased significantly. Admission standards have generally declined. The cost to the Commonwealth of supporting the system has increased to such an extent that its affordability and sustainability has been drawn into question, while many institutions have become reliant on income from international students to offset funding shortfalls for domestic students and for research.

In the absence of additional funding per student from the Commonwealth, regulatory reform is urgently needed to give universities and other higher education providers the freedom to better align income in each discipline with their actual costs of delivery. We believe this can be done transparently, ensuring that providers do not inflate student fees unfairly. Without such reforms, our view remains that the long term quality, sustainability, international competitiveness (and attractiveness) of Australia's university system is at risk.

5. Postgraduate Commonwealth Supported Places

The continuing lack of a regulatory framework and policy process to enable the Australian Government to allocate Commonwealth Supported Places (CSPs) to support new postgraduate level courses remains a significant barrier to universities meeting the needs of the new economy. This unfortunate policy vacuum has existed since the introduction of the demand-driven system was announced in 2010. A review conducted by the former Government in 2011 failed to resolve the problem. This has directly affected this University's ability to offer a number of courses in areas of national priority and identified skills shortage. For example, the long term sustainability of an innovative new Graduate Entry Masters of Nursing course, which commenced this year at our Westmead Campus, is threatened by the ongoing policy and regulatory uncertainty that exists in relation to postgraduate CSP allocations.

6. Higher degree by research training and graduates

Longstanding regulatory restrictions and funding challenges threaten the capacity of Australian universities to deliver higher degree by research training programs to meet the future requirements of the academy, industry and the broader economy. Recently these issues have been considered in detail by the Watt Review of Research Policy and Funding, and by the Australian Council of Learned Academies' (ACOLA) review of the Research Training System, with the University making detailed submissions to both reviews.[19]

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[18] The University of Sydney (March 2011), *Submission to the Review of Higher Education Base Funding*, p.3

[19] https://www.education.gov.au/review-research-policy-and-funding-arrangements; http://acola.org.au/index.php/projects/securing-australia-s-future/saf13-rts-review; http://sydney.edu.au/about/government/submissions_2015.shtml#funding; http://sydney.edu.au/about/government/submissions_2015.shtml#research-training-system

The University of Sydney broadly welcome the reforms to Commonwealth block funding for university research training programs that are now being implemented following the Watt Review. These will significantly simplify the funding arrangements and provide institutions with greater flexibility over the use of available resources. We keenly await the release of the report of the ACOLA review, and hope it will recommend further much needed regulatory and funding reforms to enable universities to improve the quality and relevance to industry of their research training programs.

ToR 3 - Factors that discourage closer partnerships between industry; in particular SMEs, the research sector and education providers; including IP, technology transfer and rapid commercialisation.

While we have many very successful collaborations with private and not-for-profit industry partners, we have identified the following key internal factors that currently work against closer partnerships with industry, and in relation to the commercialisation of our research:

- sometimes weak researcher skills in industry engagement, commercialisation and entrepreneurship;
- limited internal and external incentives for researchers to prioritise engagement alongside other research and teaching obligations;
- an insufficiently clear, long term and well-coordinated university-wide strategy in relation to industry engagement and technology transfer, with current interactions being decentralised and not always interconnected;
- limited dedicated resources for industry engagement and commercialisation, including spaces and funds; and
- limited visibility in relation to our successes in industry engagement and knowledge transfer.

We are addressing these challenges in our 2016-20 Strategic Plan, and are engaging with governments to try to make the policy and regulatory environment more supportive of research and innovation. We note, however, that while new products and services may be created by existing industries, a different set of government policies and institutional strategies is needed to support the generation of new businesses and industries created by entrepreneurial graduates, and by others who might wish to take advantage of new knowledge generated by universities.

As noted in our response to ToR 1 above, data released recently by the Reserve Bank show that over the last decade, by far the strongest areas of employment growth in Australia have been in the services sector in roles requiring high-level skills.[20] We agree with the Bank that there is a need for a renewed national focus on investment in human capital, to ensure that Australia has a workforce equipped with the high-level skills needed to support existing industries, and to deliver new ones.

The creation of new industries is not predicated only on the commercialisation of research, but may also result from a cohort of highly skilled graduate entrepreneurs. In the United States, for example, Forbes Magazine's ranking of the most entrepreneurial universities and colleges in North America mines LinkedIn data to identify the proportion of colleges' alumni and students who are new business founders and owners.[21] Even a decade ago, alumni of MIT (which ranked second behind Stanford in the 2015 list) had some 25,600 active companies employing over 3 million people.[22] Many, but by no means all of these companies, involved the commercialisation of research generated by universities.

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[20] Lowe P., op.cit.
[21] Chen L., (2015), *Startup Schools: America's Most Entrepreneurial Universities*: http://www.forbes.com/sites/liyanchen/2015/07/29/americas-most-entrepreneurial-research-universities-2015/
[22] Block, G. D., (2012), Vice-Chancellor, University of California, Los Angeles, *Globalisation and Innovation: the Transformation of Higher Education in the 21st Century,* in 2012 *International Presidential Forum on Global Research Universities: Effective Education and Innovative Learning*, Kaist Press

The reasons for significant differences between Australia and the United States in research commercialisation and new business creation reflects a complex mix of structural, geographic, cultural, policy, funding and tax factors. Critically, levels of public investment in basic research are much higher in the US, while large-scale manufacturing and technology firms have a relatively weak presence in Australia. Therefore, the focus of Australia's knowledge transfer policy may need to be rewarding education and research excellence, and be providing an environment that is highly conducive to the creation of new industries and jobs – jobs based on intellectual property generated by universities, but also on the skills and knowledge of their graduates. In our submission to the Research Training System Review we recommended longitudinal tracking of the career outcomes of higher degree by research graduates. There may also be value in the Australian Government working with the sector to establish appropriate measures of graduate entrepreneurialism.

Finally, Australia's intellectual property, tax and other policies do not currently create an environment that is as conducive to research commercialisation, as is the case in leading innovative countries such as the United States. There have been some significant recent improvements made to the tax arrangements for share options in start-up companies, and in relaxing restrictions of the use of patents for experimental use. The Australian Government's December 2015 Innovation Statement included various welcome initiatives which, if supported for the long term, should improve the environment for innovation, research commercialisation and entrepreneurship.

Further work is required in relation to the rules for IP arising from research funding provided by Commonwealth agencies other than that of the NHMRC and ARC, as well as in the critical 'proof-of-concept' phase of the research commercialisation process. We are pleased therefore to be part of the Group of Eight universities' efforts to establish a $200 million research commercialisation fund.

The university has also provided a detailed submission to the Productivity Commission's current review of IP arrangements, outlining the reforms we think are needed to further facilitate and incentivise knowledge transfer.[23]

ToR 4 - Relationships between tertiary education entrepreneurship programs and private incubator and accelerators.

The University has a broad range of programs and relationships that span the continuum, from entrepreneurship experiential learning, to incubators and startup accelerators. For example:

- Our Faculty of Engineering and IT offers entrepreneurial learning modules to its outstanding students, including:
    - Technology Venture Creation, devised by alumnus Matt Barrie, CEO of Freelancer.com. See: https://cusp.sydney.edu.au/students/view-unit-page/alpha/ELEC5701
    - Startup business planning as part of the "Advanced Engineering" program, See: http://sydney.edu.au/engineering/futurestudent/advanced_engineering.shtml
- The University of Sydney Business School provides the Genesis Startup Program, a university-wide incubator, bridging theoretical learning and real-world applicability. There were 154 student enrolments in 2015. See: http://sydney.edu.au/business/genesis/sydney_genesis_entrepreneurship_program
- The University of Sydney Union (a student representative organisation) runs INCUBATE, an award winning startup accelerator program open to students, staff and alumni. There are two cycles per year. In 2015 there were 111 applicants, with 37 founders and 13 companies.

[23] http://www.theaustralian.com.au/higher-education/go8-to-set-up-200m-innovation-fund/news-story/67e3e4a5e80fe22fd9619e7cdbc1eb02; http://sydney.edu.au/about/government/submissions_2015.shtml#pip

Over 800 attendees participated in open entrepreneurial events run by INCUBATE in that year. See: http://incubate.org.au/about/.

- The University partners with, and is a 25% shareholder in, ATP Innovations, Australia's leading startup incubator, located in Sydney. There is significant engagement between entrepreneurial staff and students, both for its training and acceleration programs, and through its portfolio companies. ATP Innovations' portfolio companies have, since 2006, raised $150m and employed over 350 people, 10% of whom are recent graduates. See: http://atp-innovations.com.au/.

We would be delighted to discuss these initiatives and others with the Committee, and would be pleased to host committee members for consultations and site visits that would be of interest.

Ends/

References

AiGroup (2012), *Lifting our Science, Technology, Engineering and Maths (STEM) Skills*

Arum, R., & Roska J. (2011), *Academically Adrift: Limited Learning on College Campuses, Chicago,* University of Chicago Press

Arum, R., & Roska J. (2014), *Aspiring Adults Adrift: Tentative Transitions of College Graduates,* University of Chicago Press

Australian Government (Dec 2015), *National Innovation and Science Agenda*

Australian Academy of Science (March 2016), *Decadal Plan for Mathematical Sciences (2016-2025)*

Block, G. D., (2012), Vice-Chancellor, University of California, Los Angeles, *Globalisation and Innovation: the Transformation of Higher Education in the 21st Century,* in 2012 *International Presidential Forum on Global Research Universities: Effective Education and Innovative Learning*, Kaist Press

Chen L., (2015), *Startup Schools: America's Most Entrepreneurial Universities*

Committee for Economic Development of Australia (June 2015), *Australia's future workforce*

Deloitte (2014), *Positioning for prosperity: catching the next wave*

Department of Education and Training (ongoing), *Quality Indicators for Learning and Teaching*

Department of Education and Training (2015), *Higher Education in Australia, a review of reviews from Dawkins to today*

Department of Prime Minister and Cabinet (2015), Reform of the Federation White Paper, *Education Issues Papers*

Education Council (Dec 2015), *National STEM School Education Strategy*

Gonski D., *et al*. (2011), *Review of Funding for Schooling*, Final Report

Griffith University, *Australian Strategy for Asian Language Proficiency*

Kennedy J., Lyons T., Quinn F., (June 2015), *The continuing decline of science and mathematics enrolments in Australian high schools, Teaching Science Journal*, Volume 60, No 2

Lowe P., Deputy Governor, Reserve Bank of Australia (Nov 2014), *Address to the Australian Business Economists (ABE) Annual Dinner*

OECD (Nov 2015), *Education at Glance 2015: OECD Indicators*

Pascarella, E.T., & Terenzini, P.T. (2016), *How College Affects Students, Volume 2: A Third Decade of Research*, San-Franscisco: Jossey-Bass

University of Sydney (March 2011), *Submission to the Review of Higher Education Base Funding*

University of Sydney (Oct 2014), *Towards a distinctive Sydney education: a discussion paper*,

University of Sydney (June 2015), *Developing a distinctive undergraduate education, Strategic Planning for 2016-20, Discussion Paper No.1*

University of Sydney, Workplace Research Centre (2014), *Employer Satisfaction Survey, Report for the Department of Education*:

University of Sydney (August 2015), *Submission to the Australian Council for Learned Academies (ACOLA) Review of Research Training*

University of Sydney (Sept 2015), *Submission to the Watt Review of Research Policy and Funding Arrangements*

University of Sydney (Dec 2015), *Submission to the Productivity Commission's Public Inquiry into Intellectual Property Arrangements*

Watt I., et al, (December 2015), *Watt Review of Research Policy and Funding Arrangements*