SWINBURNE UNIVERSITY OF TECHNOLOGY

Culture is King

Swinburne's submission to the *Boosting the Commercial Returns of Research* Discussion Paper

November 2014

In memory of our late Deputy Vice-Chancellor (Research and Development), Professor George Collins.

1. Executive summary

Commercial returns from publicly funded research will increase when the quality and quantity of deal flow increases. Individual financial incentives for researchers, including IP ownership, have not been successful in driving deal flow. Rather, a university's internal culture of innovation and commercialisation, the quality of expert advice available to researchers, easy access to support mechanisms designed to facilitate deal flow, and a university's long term investment in forging relationships with commercial partners are more important than fluctuating external policy settings.

The single biggest factor in a university's success in securing strong commercial outcomes is the culture of innovation created by the university itself. Three factors within the university are most conducive to strong commercialisation outcomes. These are:

- strong university leadership that reinforces the message that innovation is everyone's business and places equal emphasis on research excellence and the application of that research;
- promotion of industry engagement at every level of the university – from good undergraduate industry-based learning experiences which are instrumental in developing good university and business linkages through to the development of entrepreneurial skills for academics and incentives for pursuing research translation opportunities;
- dedicated support to manage intellectual property, help academics to identify and assess opportunities for commercialisation and source expert advice, find matches with development partners, and provide commercially aware legal and administrative support.

Better translation of research into commercial outcomes will help drive innovation in Australia, grow successful businesses and research capacity and boost productivity and exports. However, while there are clear direct and indirect benefits of research translation, commercial returns can take a long time. Only a small proportion of research development initiatives ultimately make it to market and it is not uncommon for it to take decades to break even. The costs and risks involved in such long term commitments are often outside the realm of possibilities for small or medium sized Australian businesses. Government could assist achieve better translation of research into commercial outcomes by recognising this and providing funding to enable enterprises that are not normally involved in research commercialisation to partner with universities[i].

One international model that Swinburne believes could work in Australia is the UK Knowledge Transfer Partnerships, which amongst other things provides funding support for graduates to work on an innovation project within a business enterprise for 12 months, while still supervised by and attached to the university (Appendix A).

Finally, we believe the emphasis on providing better general access to intellectual property in the Discussion Paper is misplaced. While universities do contain a great deal of knowledge, the process of transforming knowledge into intellectual property and then to a commercial product or service is highly complex and creative – and expensive. The notion that universities are untapped sources of underexploited intellectual property requires further scrutiny.

2. Swinburne innovation system

At Swinburne, commercialisation is viewed as a pathway from research output to industry and community impact. Our commitment to practical innovation has a long history, which can be traced back to our original establishment as a technical institute in the service of local employers and communities. Key to our more recent 21st century success has been our ability to envisage the whole of Swinburne University as an innovation system.

Some of the structural and cultural characteristics of the Swinburne innovation system are:

- positive undergraduate industry-based learning experiences;
- early identification and training of next-generation researchers, innovators and entrepreneurs;
- a strong focus on priority research areas and research planned towards commercial outcomes;
- incentives for the creation of new knowledge and Intellectual Property;
- broad ranging engagement in consultation projects, partnerships and ventures with industry, community, other national and international researchers;
- a dedicated commercialisation support unit facilitating good access to external commercialisation expertise;
- 'matchmaking' researchers with industry and businesses;
- professional pursuit of appropriate commercial opportunities, underpinned by good enabling legal and administrative support services; and
- a culture that rewards cooperation, problem solving and industry engagement.

Some of these characteristics are discussed in more detail below.

2.1 Research priorities

Swinburne does not try to be everything for everyone – our emphasis in on science, technology and innovation. We aim to produce outstanding, relevant research and to be the partner of choice for the industries and communities we serve.

In order to increase the impact of our research we focus our effort in five key research outcome areas.

Future manufacturing: integrating materials and manufacturing technologies with design, automation and information technologies to create new business opportunities

Sustainable futures: combining the engineering, social and environmental elements that address sustainability issues, inform public debate and influence government policy

Digital frontiers: changing the way we work, communicate and socialise through advances in information and communication technologies, business innovation and design;

Personal and societal well-being: improving health and psychological wellbeing, tackling quality of life and related social issues, and addressing the needs of socially disadvantaged groups and individuals;

Inspirational science and technology: capitalising on the University's strength in fundamental science and astrophysics to ignite the interest of the community and stimulate the next generation of leaders in science and technology.

Amongst other benefits, this research focus assists Swinburne in building recognition in the market and a stable profile with potential commercial partners.

It is important to stress that while we are clear about our research priorities, they do not operate as a gateway or barrier. At Swinburne we are open to examining all emerging potential research commercialisation opportunities – and no good idea is left behind.

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2.2 Swinburne Knowledge and Swinburne Ventures Limited

At the centre of the Swinburne innovation system is a small team, Swinburne Knowledge, which manages the University's intellectual property and provides leadership, facilitation and expert advice.

Swinburne Knowledge was established in July 1999 to focus on the core activities of intellectual property management and commercialisation processes, industry engagement and supporting a culture of innovation. Its focus is to emphasise that entrepreneurship is not the responsibility of a small part of the organisation, but must be embraced as a natural part of all University activities. The Swinburne Knowledge three-person team manages the University's Intellectual Property and facilitates, supports, and monitors the University's commercialisation activities. It provides advice and expertise to Swinburne staff and students who are operating or planning commercial activities.

Swinburne Ventures Limited was established in 2001 as Trustee of the Swinburne Intellectual Property trust. It is a company limited by guarantee, with Swinburne University of Technology as the sole member. The Vice Chancellor has the delegated authority of the University Council to assign intellectual property owned by the University into the Trust for the purpose of commercialisation. Swinburne Ventures is supported by a high-level board, well qualified to advise the University on the development of commercial activities. The University appoints the company's directors, who are all external, except for the Director, Swinburne Knowledge, which is a functional appointment.

The role of Swinburne Ventures is to scrutinise and evaluate the opportunities for commercialisation brought to its attention by Swinburne Knowledge or the senior management of the University, and to provide advice on:

- whether the opportunities should, in fact, be developed and resources provided
- if so, what would be the most appropriate strategies to take to develop them
- if injection of seed capital or venture capital is needed, where to go to source this capital
- whether the University should invest in the development of the innovation itself
- whether spin-off companies should be formed.

A relatively small investment fund is managed by Swinburne Ventures to provide early stage support for emerging projects.

Perhaps the most important feature of the Swinburne approach is the marshalling of external expertise. The current Chair of Swinburne Ventures is prominent venture capitalist Mr John Dyson. Swinburne is already seeing the benefits of engaging the commercial expertise of the Swinburne Ventures Board in discussions on the potential development and commercialisation pathways for research outputs prior to their formal disclosure as inventions. This has resulted in a more targeted approach to patent filing and early identification of potential licensees and investors.

Since its inception, Swinburne Knowledge has started more than 13 companies and facilitated Swinburne's investment in a further 9 entities established by third parties. These ventures secured external investment of roughly $25 million. In 2013 Swinburne still retained an equity position in 7 of the 22 companies.

Swinburne Knowledge also pursues licensing opportunities. In 2013 there were 12 active licenses with revenue of $232,000. Cumulative licensing revenue for the prior 5 years was $1.3 million.

Consulting revenues in 2013 amounted to $8 million, generated from 129 contracts for services that utilised Swinburne's knowledge capital.

RESEARCH TRANSLATION CASE STUDY – ASTROPHYSICS

Hidden Universe

Hidden Universe is a documentary that brings to life the farthest reaches of our Universe through real images captured by the world's most powerful telescopes.

Hidden Universe is the first IMAX 3D film produced and directed by an Australian team.

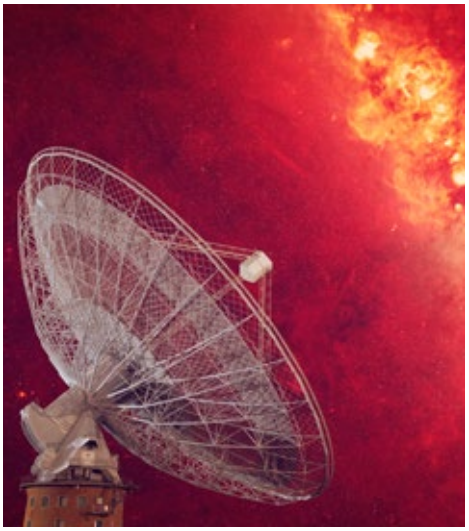
The film, released in June 2013, is the result of a partnership between Swinburne University of Technology's Centre for Astrophysics and Supercomputing, Australian company December Media Productions, the European Southern Observatory, McGillivray Films and Film Victoria.

Hidden Universe showcases the university's ability to undertake ground-breaking work in collaboration with external partners.

It took a unique combination of innovative and experienced people with talents in 3D production, educational outreach, and astrophysics, who used our Green and gSTAR supercomputers and the High Definition Virtual Reality Theatre.

Ventures like this highlight the depth of our expertise at Swinburne in science and technology – and in particular our leading role in astrophysics.

It also underlines our commitment to sharing knowledge with the community.



For more than a decade, Swinburne Astronomy Productions has shared the vision of the Centre for Astrophysics and Supercomputing to "inspire a fascination in the Universe".

Russell Scott – the writer and director of Hidden Universe, and the 'instigator' of this project – and Sam Moorfield – the team leader for the computer-generated imagery sequences – are both graduates of the Bachelor of Multimedia at Swinburne.

In 2008, Russell had the opportunity to visit the Very Large Telescope array in Chile and thought "wow – this needs to be seen on a big screen".

He looked to industry for a partner, and Tony Wright and his associates at December Media saw the potential.

Hidden Universe makes extensive use of real astronomical data, including simulations of the Universe that were undertaken on both the Green supercomputer and gSTAR.

It took engagement across the university, with supporters at the highest levels prepared to take a risk on making this movie.

Hidden Universe is a very exciting step forward in linking our work at Swinburne to a wider, global community and exciting them about their place in the Universe.

2.3 Appropriate administrative support

One of the most important facilitators of deal flow is responsive, appropriate administrative and legal support. It is notable that the quality of the legal advice provided by Swinburne Legal has been integral to the success of commercialisation and collaborative research initiatives. Swinburne Legal is commercially aware and offers timely advice that is not overly risk averse. Intellectual property agreements can take varying lengths of time to negotiate but are generally completed within three or four weeks. Our Swinburne experience is starkly at odds with the statement in the *Boosting the Commercial Returns from Research* Discussion Paper, which states in Section C that Intellectual Property contracts typically take 10 months to negotiate.

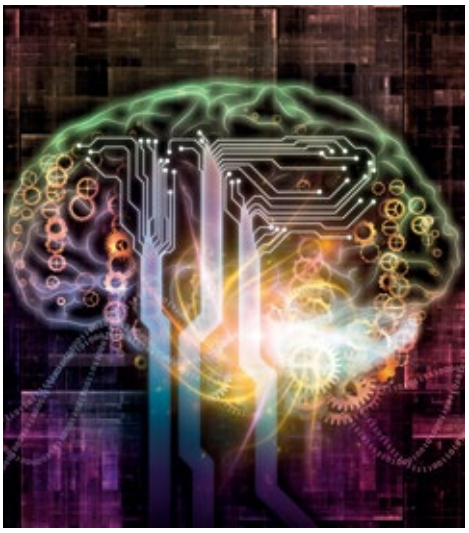
2.4 Intellectual property management principles

The Australian Research Council provides guidance for the ownership, promotion, dissemination, exploitation and, where appropriate, protection of Intellectual Property generated through Australian Government funded research by public sector institutions. Consequently all Australian universities, including Swinburne, have intellectual property policies that include incentives for researchers to commercialise. At Swinburne, intellectual property is divided three ways, recognising the inventors (40%), the faculty (30%) and the university (30%), with 90 per cent of the first $100,000 generated going to the inventors.

In 1999 the University of Melbourne changed its Statute so that researchers would own all of their intellectual property. Swinburne notes that the response to this move was underwhelming and the university reversed the decision after 8-10 years – an outcome that adds to the growing body of evidence that intellectual property ownership, while important, is not the primary driver for researchers.

RESEARCH TRANSLATION CASE STUDY – BRAIN AND PSYCHOLOGICAL SCIENCES RESEARCH CENTRE

Cortical Dynamics



Cortical Dynamics is a joint venture to commercialise brain function monitoring technology developed by Swinburne's Dr David Liley.

The lack of technology to accurately monitor the state of the brain during anaesthesia is considered to be the main reason for over- and under-sedation. While surgical patients fear the trauma of 'feeling the knife', hospitals and medical staff are equally afraid of ensuing litigation.

Dr Liley and a team of researchers and entrepreneurs have developed a technology called the Brain Anaesthesia Response (BAR) monitoring system. The BAR monitor is a world-first device to replace existing Electroencephalography (EEG) monitors.

Following initial market assessment of possible commercial pathways for the brain function monitor a provisional patent application was filed. The first application was to improve how we measure the depth of amnesia, but wider applications were envisaged.

No suitable potential licensees were identified in Australia or internationally, so Swinburne established a spin-off company to commercialise the technology. This was done in conjunction with the Information City Victoria Mentor program.

Swinburne Knowledge identified Perth based BioPharma (now BPH Energy Ltd) as a potential investor, and in October 2004 BioPharmica Ltd committed $950,000 to develop prototypes, complete two clinical trials and IP protection. Swinburne Ventures retained 8% of Cortical.

All Cortical's research activity is conducted by Swinburne under appropriate agreements, including a conflict management plan to cover Dr Liley's role in research.

First established in 2004, the project demonstrates the need for long term commitment and the need to be flexible in defining commercial pathways in light of market conditions and gathered data.

The project has received an $186,000 NHMRC development grant and generated 21 patent applications in 5 families based on Swinburne-generated IP, several high impact publications and high level academic collaborations facilitated by Cortical.

2.5 Encouraging an entrepreneurial culture

At Swinburne, all our research staff are encouraged to contribute to University-wide initiatives to improve industry engagement – and stimulate an entrepreneurial culture. This involves:

- targeted national and international collaborations aligned to the areas of research focus alongside more comprehensive, multi-dimensional partnerships with selected organisations;
- increasing the number of interdisciplinary projects conducted collaboratively with partners ranging from SMEs to large corporate, not-for-profit organisations and peak bodies including industry and professional associations;
- using the Swinburne Design Factory to promote innovative, industry-engaged inter-disciplinary research;
- encouraging Swinburne researchers to be 'thought leaders' who contribute advice on public policy directions and settings;
- responding creatively to identified government priorities in education, workforce development and research, particularly in relation to science, technology and innovation, but also through social and enterprise research; and
- benefitting from alumni links to industry and community.

At Swinburne, all our research staff are encouraged to contribute to University-wide initiatives to improve industry engagement – and stimulate an entrepreneurial culture.

Swinburne Knowledge further stimulates entrepreneurial activity by offering the Swinburne Innovation Cup (in conjunction with the existing Swinburne Venture Cup) to raise the profile of research commercialization initiatives, develop the University's research staff and increase the potential deal flow.

RESEARCH TRANSLATION CASE STUDY – SWINBURNE DESIGN

Swinburne Innovation Cup

In recent times the PNG balsa industry has increased in global volume and value due to the demand from China to manufacture renewable wind energy farms. The industry has in turn provided employment to a large population of locals particularly in the PNG province of East New Britain.

But the global financial crisis changed that and the industry is now one in over supply and under demand.

Nathan Kotlarewski, a PhD student at Swinburne University of Technology's Centre for Design Innovation, has been looking at ways to develop new and novel products for the PNG balsa wood industry—which in turn is helping to protect the incomes of the locals who heavily depend on the industry.

A specific part of Nathan's research has focussed on "Balsalation" or new ways to use balsa panels for interior wall or ceiling linings to enhance the thermal and acoustic insulation of interior dwellings.

Nathan's "Balsalation" projects ticks all the boxes in sustainability, social responsibility and this year has also earned him the honour of winning the 2014 Swinburne Innovation Cup.

His $10,000 prize will go towards the commercial development of products using PNG balsa.

2.6 Research partnership continuum

Improving commercial returns is not something that can be achieved overnight. Building a culture of innovation involves encouraging researchers to engage with industry and the community as a matter of course. There is a continuum between consulting and nationally significant research. Undertaking small consulting tasks for industry clients can build trust – mutual understanding and respect for capabilities. As each learns more about the other's business, problems can be jointly identified and the university can begin the research effort involved in solving those problems. Collaboration on small projects leads to understanding problems, which in turn leads to solution directed research and deep commercialisation opportunities.

As well as focusing on the barriers to translating research into commercial outcomes, Swinburne is now using this insight into the commercial partnerships continuum to investigate how to plan and conduct research towards a commercial outcome.

3. Government investment for future competitiveness

While Swinburne is broadly supportive of some of the proposals outlined in the *Boosting the Commercial Returns from Research* discussion paper, we are of the view that stable and consistent government policy settings and support for universities will achieve more than adjustments at the margins of research funding programs.

By making a stream of funding available, government could support small and medium sized enterprises to work with universities to identify problems, undertake targeted, solution based research and translate findings into commercial returns.

Rather than toying with research funding incentives, the current focus on boosting commercial returns from research is an opportunity for Government to recognise that research translation and commercialisation activity is costly and that there can be a long wait for returns on investment. Small to medium sized enterprises in particular do not have the capital to sustain long term relationships.

By making a stream of funding available, government could support small and medium sized enterprises to work with universities to identify problems, undertake targeted, solution based research and translate findings into commercial returns. An example of a successful government intervention in this arena internationally is the UK Knowledge Transfer Partnerships (see information provided below). Australian enterprises would also benefit from Government support to partner with researchers on translating and transferring technological developments into industry practice, similar to the assistance provided by the UK Catapult Centres.

If Australia is to remain internationally competitive there is also a gap in support for larger-scale, longer-term collaborations with industry partners that are able to go beyond low-risk research.

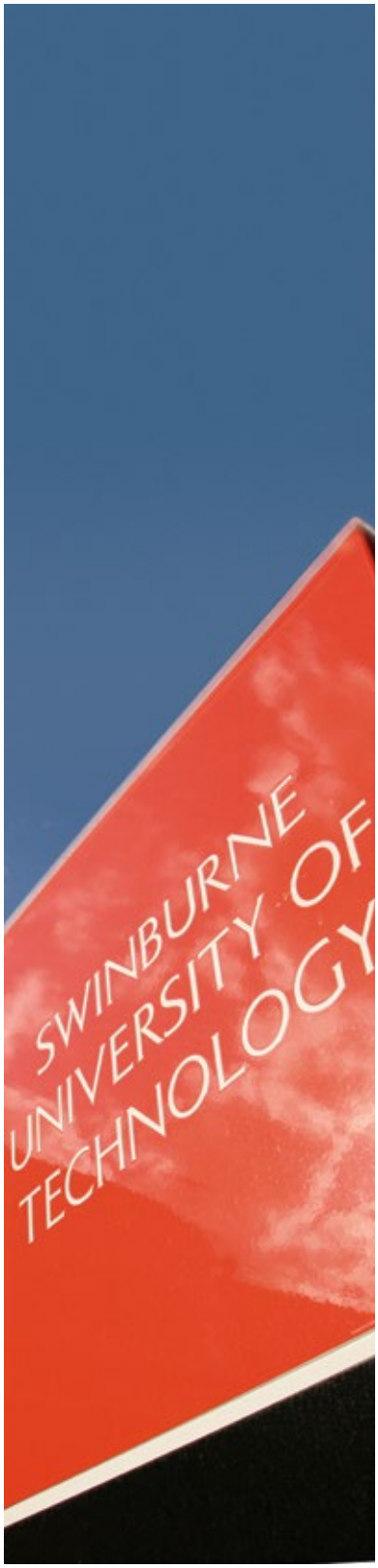
The European Union has recently announced Horizon 2020 – the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020) – in addition to the private investment that this money will attract. It promises more breakthroughs, discoveries and world-firsts by taking great ideas from the lab to the market. The goal is to ensure Europe produces world-class science, removes barriers to innovation and makes it easier for the public and private sectors to work together in delivering innovation[ii].

4. Conclusion

Swinburne has a clear focus on being Australia's leading university of science, technology and innovation. Translation of research into public good and commercial outcomes is core business.

Over the past 20 years Swinburne has operated under many different funding regimes intended to promote research commercialisation, each of which has had mixed outcomes. While funding schemes come and go, the single biggest factor in securing strong commercialisation outcomes at Swinburne has been the culture of innovation created by the university.

The best way for Government to boost commercial returns from research is to maintain a stable policy and funding environment for universities, while recognising the need for a new funding stream to encourage Australian small and medium sized businesses to work with researchers; and to support large scale long term high risk collaborations with industry.



About Swinburne

For more than 100 years, Swinburne has been committed to innovative education, producing outstanding graduates and delivering enduring outcomes for our industry partners.

With a focus on science, technology and innovation, our reputation for high quality, engaged teaching and research is reflected in Swinburne's consistent ranking among the top 3% of universities in the world.

Appendix A

UK Knowledge Transfer Partnerships

Knowledge Transfer Partnerships (KTPs) are programs partly funded by the UK Government that help companies access the wealth of knowledge, expertise and resources available in Universities.

KTPs basically involve a graduate working on a project identified as central to a company's future commercial development. Businesses involved in KTPs need to have identified a strategically important project, with the objective of improving turnover and gaining market share, intellectual property and a competitive edge.

A suitably qualified graduate – jointly supervised by the company and the University – will then work in the company for between one and three years to implement the project. This individual – known as a KTP associate – is jointly supervised by both the business and academic staff. Up to 60% of the cost of each Knowledge Transfer Partnership, including the KTP associate's salary and the academic's time, are covered by a government grant.

At the heart of each KTP is a relationship between a company and academic staff in UK Universities. University expertise is applied to a project that is central to the development of the business partner. Knowledge Transfer Partnerships enable each university to apply its wealth of knowledge and expertise to strategic business problems. KTPs are Government funded and enable UK businesses to benefit from the wide range of expertise available at each University.

Each KTP is managed by a team involving staff from the University along with the Company Partner and a recently qualified graduate recruited as the KTP associate. The graduate is appointed in open competition and may not necessarily be a former student of the partner institution. This ensures that the most relevant person is chosen for the program.

For each KTP Associate on a two year program, regardless of the size of the company, the total budget is approximately EUR 150 000. The largest part of the funding employs the Associate and contributes to staff costs at each university for those directly involved in the partnership.

On recruitment, a KTP Associate becomes responsible for management of the Project, drawing on the expertise of the academics involved in the KTP, facilitating knowledge transfer, and implementing it within the business under the supervision of, and with input from, company staff. An Associate can be thought of as an 'agent of change' who, by applying their own recent 'learning' in an appropriate discipline, is helping the company to introduce new products or processes, or to develop or improve existing products or processes[iii].

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[i] This is consistent with the findings of the March 2005 Evaluation of incentives for commercialisation of research in Australian universities report. http://ict-industry-reports.com/wp-content/uploads/sites/4/2013/10/2005-Incentives-for-Commercialisation-University-Case-Studies-Yencken-DEST.pdf

[ii] http://ec.europa.eu/programmes/horizon2020/en/what-horizon-2020

[iii] http://www.oecd.org/site/cfecpr/39137678.pdf