WG3.3 Industry and Translation Report

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Industry engagement is vital for the astronomy community to harness the full potential of scientific advancements, drive technological innovation, and maximize the societal impact of astronomical research. Collaboration between academia and industry fosters a mutually beneficial relationship that accelerates progress in understanding the universe while contributing to economic growth and innovation. It is crucial to provide enhanced industry engagement for research to enable greater government financial support for both applied and fundamental research. The working group sets out recommendations we believe will foster improved industry engagement and research translation.

Industry engagement provides benefits to both industry and researchers. Industry possesses resources and expertise complimentary to the university sector, enabling accelerated innovation and enhanced capabilities of astronomical instrumentation. This fosters technology transfer and commercialisation opportunities resulting in economic benefit to both industry and research organisations and a willingness to continue engagements long term. Engaging with industry enhances the relevance and impact of astronomical research through avenues such as instrumentation to provide benefits to society and address government priorities.

Aims

The aims of this working group are to make recommendations to:

- Increase industry engagement with enhanced collaborations and partnerships
- Facilitate technology transfer and commercialisation to ensure benefits of research are shared with society
- Communicate and promote the impact of research, highlighting the link between fundamental research and outcomes
- Enhance industry awareness of research needs, expertise, and opportunities for engagement, while highlighting the benefits to industry of working with research organisations
- Stimulate innovation and encourage the development of innovative solutions addressing challenges in astronomy through collaboration between research organisations and industry, fostering a culture of innovation and entrepreneurship
- Support skills development and training programs to create a pipeline of students for industry and skills in researchers to enable future industry engagement

Challenges

- Cultural differences between research organisations focused on research questions and industry focused on outcomes
- Mismatched expectations between industry and research organisations who have fundamentally different objectives

- IP and commercialisation benefits are always a challenging area to negotiate between parties who are both taking risks and providing value
- Resource constraints for both industry and research organisations means that industry engagement is often an afterthought and not a pillar of activity

Increasing Collaboration

Enhanced collaboration between industry and astronomy research offers significant benefits to both sectors, fostering innovation, accelerating technological advancement, and driving economic and scientific progress.

For industry, collaboration with the astronomy community provides industry with direct access to cutting-edge scientific research, advanced technologies, and specialised expertise. This can lead to the development of new products, services, and technologies that give companies a competitive edge in the market, and provides access to funding sources requiring academic or research partnerships. This enhances the capabilities of industry to provide a market advantage.

For researchers collaboration with industry can provide astronomy research with additional funding streams and access to advanced technologies, techniques, and infrastructure. This financial support is crucial for large-scale projects through funded grant programs that can require industry contributions to unlock significant grant award for research benefit.

Case Study: Using the advanced astronomical telescope SkyMapper for Space Domain Awareness

Origins and Technological Innovation

SkyMapper is a fully automated 1.35m optical telescope at Siding Spring Observatory, built in Prof. Brian Schmidt in 2007. It is equipped with a world leading 268-million-pixel camera developed by ANU engineers, capable of capturing a region of the sky 30 times larger than the full moon every minute, producing 1 GB of data per minute during clear nights. SkyMapper's capabilities extend far beyond astronomy. It records the brightness, shape, and precise location of celestial objects, using six specialised filters to provide insights into the age, mass, and temperature of stars. This cutting-edge technology is now supporting the Southern Sky Survey, pinpointing stars and galaxies for future investigations using next-generation telescopes, such as the 25m Giant Magellan Telescope. The survey has produced over 500 million objects and 4 billion detections, available to researchers through a data-sharing platform funded by Astronomy Australia Ltd.

Expanding into Industry Applications

SkyMapper's technological innovation soon attracted attention from defence and space domain awareness sectors. Its ability to track geostationary satellites and survey large areas of the sky made it a valuable tool for satellite observation and space surveillance. SkyMapper's hardware was more advanced than many existing commercial systems, positioning it as an important asset in Australia's growing space capabilities.

These industry links offer mutual benefits. Industry partners gain access to high-end hardware and data capabilities, while SkyMapper secures new opportunities for funding and long-term operational sustainability. For astronomy researchers, collaboration with industry opens new avenues for technology development and funding. Partnering with sectors such as defence and telecommunications allows researchers to apply their expertise to real-world problems, such as satellite tracking and environmental monitoring, creating opportunities for technology transfer.

Technology Transfer

Astronomy research often involves the development of highly specialised instruments, data analysis techniques, and computational tools. Industry can benefit from these innovations through technology transfer, adapting astronomical technologies for applications in sectors such as telecommunications, defence, and space applications. Having access to research capabilities provides benefits to industry through co-design and verification of cutting edge technology that will enable new markets and higher efficiencies for industry products.

Industry partnerships enable the translation of astronomical research into practical applications, broadening the impact of scientific discoveries. Astronomical instrumentation for example often requires hardware that does not exist in the commercial market. Academics developing this technology have the change to push this technology forward with industry partnerships providing benefit to astronomy research and giving industry access to new technology for application to new markets.

Research Impact

By demonstrating the practical benefits of astronomy research through industry collaboration, astronomers can enhance public engagement and support for scientific endeavours. This can lead to greater public investment in science and a stronger appreciation for the role of astronomy in driving technological and societal progress. Industry can unlock new markets for their technology through this engagement, enabling demonstrated impact from research advancing through technology readiness levels.

Technology Innovation

Industry can benefit from collaborating with astronomers to address complex challenges by developing unique and cutting edge technology solutions. Collaborations can unlock funding sources and markets otherwise unavailable to industry alone. This can reduce the risks

associated with new technology development and improve the quality and reliability of products and services.

Working with industry often requires astronomers to collaborate across disciplines, fostering innovation and new approaches to problem-solving. This cross-disciplinary exchange can lead to breakthroughs that advance both scientific knowledge and commercial technologies. A diverse skills base can create new opportunities to develop new techniques and address challenges in a new way to increase the productivity of research groups. New technology creates new research opportunities, which in turn drives undiscovered research questions feeding back into new technology requirements and advancements.

Skills Development

Collaboration between industry and academic institutions plays a vital role in driving skills development and creating a pipeline of industry ready workers equipped to tackle new technological challenges. This synergy benefits both industry and academia, ensuring that graduates are well-prepared to meet the demands of employers. Such partnerships foster long-term innovation, shared resources, and the co-creation of solutions that address both commercial and scientific needs. By engaging closely with industry, academic institutions enhance their graduates' employability and contribute to building a skilled workforce capable of advancing technological innovation and addressing future challenges-essential for industries aiming to remain competitive and push the boundaries of possibility.

Funding Opportunities

Government funding plays a critical role in advancing astronomical research, serving as the foundation for scientific discovery and technological innovation required. This financial support is not only vital for exploring fundamental science questions but also for fostering academia and industry engagement, facilitating the transfer of cutting-edge technologies developed through astronomical research into broader commercial and societal applications.

Government-funded research programs often encourage or require collaboration between academic institutions and industry partners, with a range of partnership opportunities offered supporting different technology readiness levels. Examples of these funding opportunities include the ARC Linkage Program, Cooperative Research Centres (such as the current SmartSat CRC), and the current Universities Trailblazer program with programs such as the Innovative Launch, Automation, Novel Materials, Communications, and Hypersonics Hub (iLAuNCH) Trailblazer focusing on space technology. These collaborations can lead to the co-development of new technologies and processes that benefit both the scientific community and commercial sectors. These programs can be aimed at fostering industry-academia partnerships to enable research outcomes beyond academic publications, and translational research that can drive economic growth and address real-world challenges.

It is vital that astronomical research to be recognised as a Federal Government research priority because of both the fundamental scientific discovery benefits and the technological advancement required to achieve these discoveries. The challenges faced by astronomers

often lead to breakthroughs in technology, data analysis, and instrumentation, which have wide-ranging applications across various industries. Prioritising astronomical research ensures continued innovation, attracts global talent, and positions Australia as leaders in both scientific exploration and technology development.

WG 3.3 Recommendations

Establish an Industry-Astronomy Collaboration Network:

Recognising the complexities of creating a single central body to serve the diverse interests of universities and other organisations—particularly given concerns around intellectual property and the desire for autonomy in academia-industry engagement—we propose the establishment of a flexible "Industry-Astronomy Collaboration Network." This network, overseen by a central coordination committee comprising representatives from the astronomy community, industry, government, and academia, would provide a platform for collaboration without the constraints of a formal central body.

The network would facilitate industry-astronomy workshops, webinars, exchange programs, and potentially even industry-focused innovation challenges and hackathons. By creating an online portal, the network could serve as an interface connecting the astronomy community with industry partners. This portal could offer access to information on projects, contract opportunities, resources for professional training, and best-practice guidelines for contracting and procurement. While some funding would be necessary for its operation, this approach is likely to be more cost-effective than establishing and resourcing a dedicated central body.

Incentives and Recognition for Industry Engagement:

We recommend the establishment of a dedicated Industry Engagement Prize program to support research translation and industry engagement. Support for early career researchers to achieve seed funding should be provided through mentoring and training programs focusing on these aspects. This funding would provide crucial support for early-stage collaborations between academia and industry, enabling the development of innovative solutions with commercial potential.

In addition to financial incentives, it is essential to create recognition programs and awards that celebrate successful industry partnerships. These programs could be managed by the ASA, integrating them into their existing prize offerings. Such recognition would not only highlight the value of industry engagement but also encourage more astronomers to pursue collaborative opportunities, particularly in the early career stages.

To address the unique challenges faced by academics engaging with industry—particularly the limitations on publishing research due to confidentiality and intellectual property concerns—we recommend the coordination of academic recognition for non-traditional research outputs. Research institutions should adapt their promotion guidelines to recognise a broader range of contributions beyond traditional paper publications and citations. This

could include industry reports, design documentation, patents, prototypes, software, and other outputs that result from industry collaboration.

By formally acknowledging these non-traditional research outputs, research institutions can ensure that academics who engage with industry are appropriately recognised and rewarded in their careers. This shift in academic promotion criteria would not only support those working at the intersection of academia and industry but also foster a culture of innovation and collaboration across the astronomy community.

Showcase industry-linked collaborations in the Decadal Plan
In order help normalise industry-linked collaboration by Australian astronomers and demonstrate the broad positive impact of such forms of collaboration. Various possible stories can be sourced from these URLs:

- https://astronomyaustralia.org.au/industry-engagement/
- https://www.ozgrav.org/news/industry-success-stories/
- https://www.icrar.org/industry/
- https://aao.org.au/projects/
- https://rsaa.anu.edu.au/aitc/projects

ICRAR was established to develop the capability to deliver one of the world's largest and most ambitious science projects—the Square Kilometre Array. The centre is home to more than 150 world-class scientists, engineers and big data experts, along with in-house project managers and industry engagement specialists.
https://www.icrar.org/industry/

Research School of Astronomy & Astrophysics – Advanced Instrumentation and Technology Centre (AITC)
https://rsaa.anu.edu.au/aitc/projects
The ANU Research School of Astronomy & Astrophysics (RSAA) Advanced Instrumentation and Technology Centre (AITC) projects page showcases cutting-edge projects spanning from adaptive optics to space instrumentation. These initiatives demonstrate the AITC's commitment to advancing astronomical and space research technologies.