Innovative
Research
Universities

ENGAGE
COLLABORATE
INNOVATE

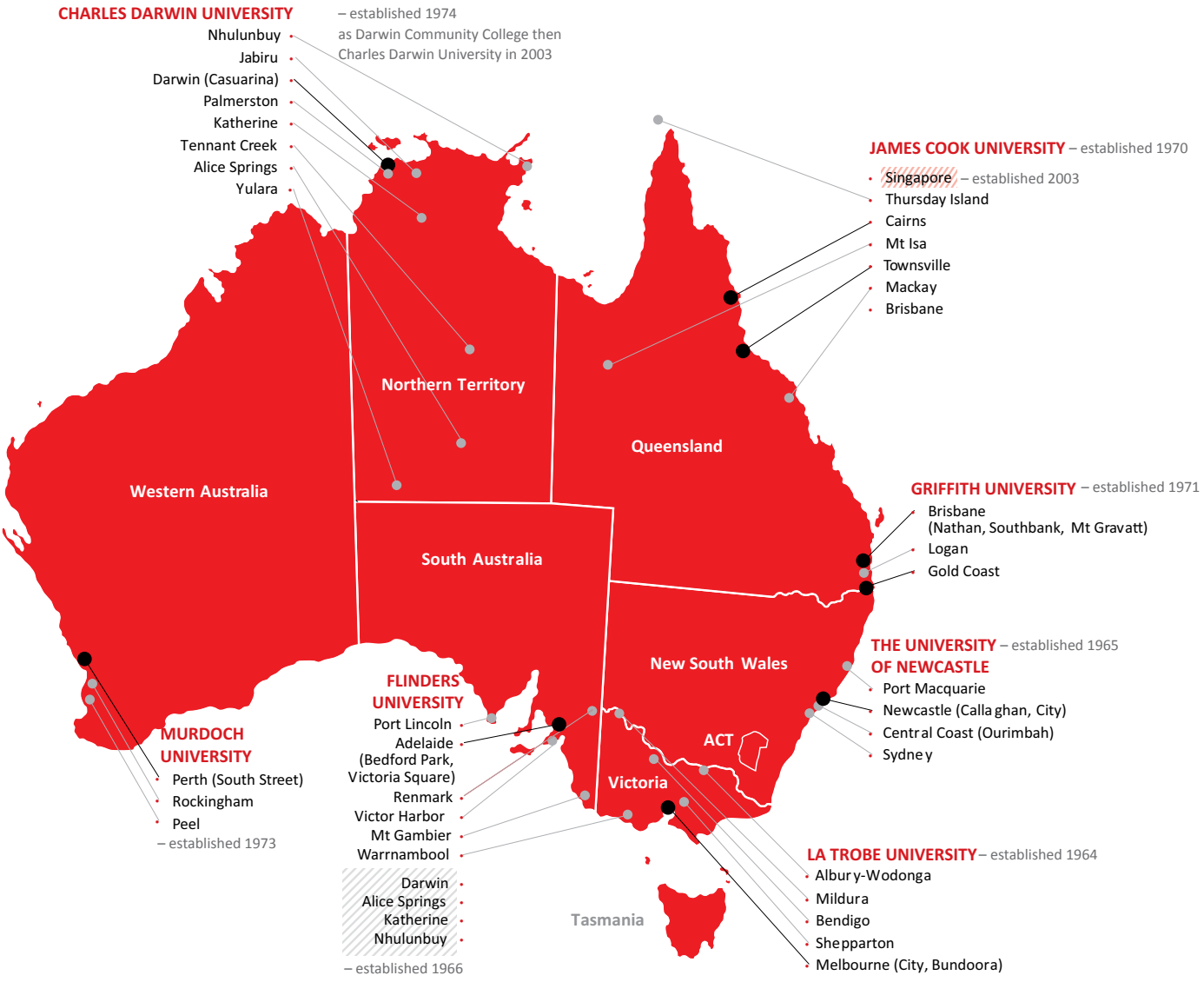
Learning
Collaboration
Opportunity

About the IRU

The Innovative Research Universities (IRU) is a network of seven comprehensive research intensive universities.

We work to advance Australian innovation by:

- advising Australian governments on higher education, research and innovation policy;
- sharing our knowledge and expertise in research, teaching and operations – within and beyond the network; and
- collaborating through forming domestic and international partnerships with industry.



Flinders University also operates in the Northern Territory.

International

The IRU working with industry

The importance of universities partnering with industry is well accepted. The benefits are extensive, for industry, universities and the nation more broadly. IRU members have consistently made clear their commitment to effective engagement with industry, leading to long-term collaborations in research and workforce development that power innovation, driving social, scientific, cultural and economic progress.

Politicians often ask how IRU members work with industry and what opportunities exist to make it more systemic. Governments at all levels make considerable investments in industry-university collaboration, and therefore have a keen interest in ensuring this investment is worthwhile.

To demonstrate the effectiveness of industry-university collaboration across the IRU and advance the shared goal of increasing and strengthening engagement, this document:

- examines the practice of industry engagement, showcasing successful collaboration across the IRU;
- identifies factors necessary to promote engagement and to ensure effective collaboration; and
- discusses opportunities to enhance and expand engagement with both individual partners and across sectors, and outlines any existing barriers to engagement.

The message from the IRU is straightforward: we are engaged with industry and seek to continue to expand this engagement; we seek to deepen and strengthen our collaborations working with colleagues in industry and government; and we do all this with a clear goal of driving Australian innovation, productivity and economic growth.

Professor Barney Glover
Chair, IRU
June 2013

Charles Darwin University
Flinders University
Griffith University
James Cook University
La Trobe University
Murdoch University
The University of Newcastle

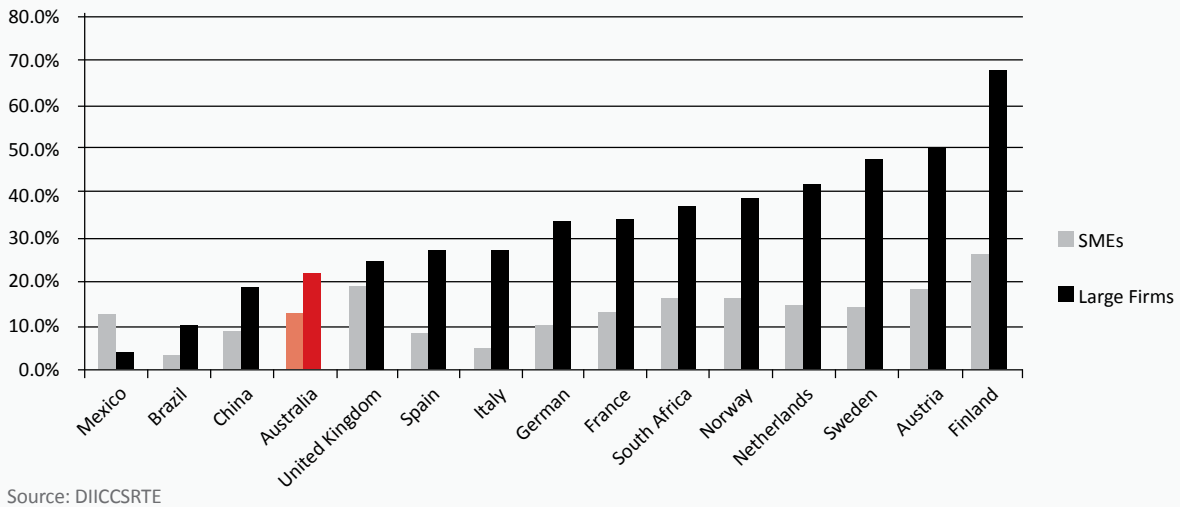
Overview

There are numerous examples of successful IRU engagement with industry both in Australia and overseas. This is demonstrated by continued strong investment from industry in IRU members, now rising again after the falls attributable to the Global Financial Crisis.

Growing the proportion of businesses that are engaging with universities, while supporting and strengthening the partnerships we already have, remains a well-recognised challenge.

Despite ongoing strong investment in universities and other public sector research organisations, only 22% of Australia's large firms and 13% of small to medium enterprises (SMEs) partner with public sector research organisations.

Proportion of businesses collaborating on innovation with public sector research organisations, 2006-2008



Source: DIICCSRTE

The nature of collaboration is fluid and broad. Engagement does not fit neatly into predetermined moulds, nor would universities seek to impose such structures on their partners. The nature of a relationship is shaped by the partner's needs and organisational scope, as well as their location and markets in which they operate.

This document explores collaborations across the following broad categories:

1. Collaborations in workforce development
2. Research collaborations with SMEs
3. Research collaborations with larger firms
4. Research collaborations with health and social service providers
5. Collaborations in regional and rural Australia
6. International collaborations

Collaborations in workforce development

Ensuring industry has a continuing supply of highly skilled, career-ready graduates is Core to IRU members' missions. Workforce development can be enhanced through up-to-date, workplace relevant curricula and student access to industry via work experience and placements.

Considerable opportunities exist for expanded and enhanced engagement that give industry direct input into the university curriculum. A recent example from the IRU is the **Toga Group's** partnership with Charles Darwin University to develop the new Charles Darwin University School of Business. The university will extend current programs to include specialist courses in hospitality, hotel management, tourism and travel linked to an alliance with Toga Hospitality and in conjunction with private sector partners.

Collaboration in curriculum does not need to be at large scales. IRU members welcome industry leaders from all categories of firm, and in all industries, to participate in the learning process by acting as guest lecturers, consulting on curriculum content and design, and through the provision of work experience and placements for students as part of work-integrated learning (WIL) initiatives.

The IRU has been a national leader in the promotion of WIL. Together with the **Australian Chamber of Commerce and Industry**, the IRU jointly developed and produced a series of resources for employers with information about WIL and how it might work within various organisations. All IRU members have further links with Chambers of Commerce and Industry in their own state. Specific examples include internships available through the **Western Australia Chinese Chamber of Commerce** for Murdoch University students undertaking the Chinese Business major, La Trobe University's work placement and scholarship partnerships with Bendigo and Adelaide Bank, and Griffith University's partnership with **Deloitte**, which gives students the opportunity to work at Deloitte Australia in a multidisciplinary team to develop a viable new business innovation.

While universities actively encourage students to take part in WIL and commit resources to matching students to relevant industry partners, some barriers to participation do exist. For many students WIL may be unaffordable if the host firm is located far from the student's residence. It is important that students in the city are able to undertake their placements in regional and rural Australia, and vice versa. A deferred loan scheme, similar to the successful OS-HELP, for students undertaking a placement within Australia, though far from home, could encourage greater participation in WIL.

It is also important to engage postgraduate research students with industry. The mutual benefit afforded by, and pressing need for work experience opportunities for these early career researchers, was highlighted by the Chief Scientist in his recent listing of *Top Breakthrough Actions for Innovation.*

Research collaborations with SMEs

Universities primarily engage with SMEs on consultancies and contracts. Often in industries characterised by a large number of small, highly competitive operators, universities will engage with industry peak bodies and membership organisations on projects that deliver benefit to the industry as a whole.

Only 13% of Australian SMEs currently engage with public sector research organisations and this presents substantial opportunities for growth.

As SMEs have fewer resources to invest in research and development and less experience of collaboration with universities, this can make establishing a partnership challenging. Initiatives such as the **Innovation Voucher** programs recently launched in Western Australia and Victoria have been created to address this. The Victorian scheme is focussed on SMEs and provides businesses with less than 200 employees substantial cost-offsets for both engaging in research and development activity, and accessing the skills and expertise of research organisations.

Such schemes are a welcome investment in innovation and engagement, and similar schemes are warranted for all states and territories, either through a national arrangement, or co-ordination of efforts through COAG.

To engage SMEs, Universities must pay attention to promoting their successes at all scales, and their research capabilities in fields that bring about incremental improvement in product and service delivery, such as market research. This will provide smaller firms with the confidence to invest.

Small scale desalination and power generation

Granite Power Limited has worked with researchers at The University of Newcastle on multiple projects. This includes developing a low-energy, small-scale desalination plant suitable for use on remote farms. The plant is designed to be run on waste heat, such as diesel fuel exhaust and will address water use issues by allowing farmers to turn brackish water on their properties into drinking water. Another project saw the development of the GRANEX power platform, an emission-free engine that turns heat from low-grade sources into electricity.

Hand held ultrasound devices

Adelaide firm **Signostics** has engineered and manufactured a hand-held ultrasound device designed to reduce the need for invasive post-natal treatments, which can effect up to 15 per cent of women. Signostics is working with partners at the Flinders University Medical Device Partnering Program to enter new markets through product testing in new clinical settings.

Rail crossing safety

SMEs **Codha Wirless** and **Embedded Systems Technology** are working with La Trobe University and a range of other corporate, government and university partners on the world's largest -known rail crossing safety study. The $5.5 million three-year project uses Dedicated Short Range Communication, a wireless technology that warns drivers of a potential collision. The system will work to protect drivers and train passengers at level crossings on Australian public roads that are not equipped with barriers or flashing lights.

Waste water management

Pacific Reef Fisheries has employed a waste water treatment process developed by James Cook University researchers and colleagues at **MBD Energy**. This process involves growing seaweed in the waste water from prawn ponds, with the seaweed itself processed into a popular Japanese condiment for export. A drying and crushing facility in Ayr will create up to 10 local jobs..

Franchising excellence

As part of a 12 year partnership with the **Franchise Council of Australia**, Griffith University's Asia-Pacific Centre for Franchising Excellence provides regular reports to industry and professional development to franchisors and franchisees through programs such as the "Buying a Franchise" course. The course has been taken by more than 5000 people.

Transport network optimisation

As part of an ongoing partnership, the **Hunter Valley Coal Chain Coordinator** is working with The University of Newcastle, using algorithmic research to optimise the annual movement of more than 100 million tonnes of coal from 35 mines along rail lines and through the Port of Newcastle.

Aquaculture

Mainstream Aquaculture, in collaboration with James Cook University, received an ARC Linkage Projects grant to develop DNA analysis techniques that will allow families of barramundi that grow to harvest size quickly and have low variability in the size of siblings to be identified early into production. The Australian barramundi farm industry is valued around $27 million, producing approximately 3000 tonnes of product a year from 40 farms.

Research collaborations with larger firms

Larger corporations, with access to significantly greater resources and experience in research and development, are able to more easily work with universities across various types of research engagement, including consultancies and contracts, commercialisation and long-term collaboration.

While larger firms engage with public sector research organisations to a greater extent than SMEs, there is still considerable opportunity for expansion and growth.

For industry, barriers to engagement are strongest amongst those firms who have not engaged previously. All investment carries some risk, and risk-averse businesses must have confidence in the capability of universities to effectively meet their needs. This barrier can only be broken down through an initial, positive experience of institutional engagement which builds trust between a firm and its university partner, and provides experience in the development and management of university engagement.

An effective way for universities to encourage first-time business investment and build trust with prospective partners is through seed-funding for new and developing relationships. This funding gives the university a financial stake in the partnership and by sharing some of the investment risk, demonstrates to industry a commitment to mutually beneficial partnerships.

To encourage researcher participation in industry collaboration, IRU universities are working to ensure a good balance of incentives for staff, ensuring industry focussed researchers are not disadvantaged in their career progression and that recognition of industry engagement is a core component of the performance review and promotions process. This can include considering contract and consultancy income, patents and commercial return on investment as performance metrics.

Further it is important that assessments of research excellence also consider industry engagement as a determinant of performance. The *Excellence in Research for Australia (ERA)* initiative, while capturing industry investment and relevant research outputs including patents, does not make clear what impact such evidence of engagement has on a university's assessed performance. The *Excellence in Innovation for Australia* trial has demonstrated that impact measurements are both possible and desirable. Industry-university partnerships do result in considerable impact, and the incorporation of impact assessments in future iterations of ERA should go some way in addressing this issue.

Oil and gas industry

Support from **INPEX**, **Total**, other participants in the **Ichthys LNG Project Joint Venture** and the Northern Territory Government has enabled Charles Darwin University to construct the $7 million North Australian Centre for Oil and Gas (NACOG). NACOG is boosting the university's research capabilities with two new laboratories that are equipped to conduct solution-oriented research and consultancy for the oil and gas industry. The state-of-the-art building also has teaching and training facilities for both Vocational Education and Training and Higher Education, encouraging more students to consider careers in the resources sector and help expand the local workforce.

Wind turbine performance testing

The National Small Wind-Turbine Test Centre at Murdoch University has undertaken work with multiple partners in wind turbine performance testing, microgeneration pilot projects and on industry standards development. Partners include **Bunnings**, **SOMA** and **Folkswind** in Australia and the **Nasi Denki Tekko Company** and **Teroc AB** internationally.

Nature Bank

In a 10 year, $110 million relationship with multinational **AstraZeneca**, Griffith University's Eskitis Institute established the Nature Bank, a collection of 45,000 samples derived from plants and marine invertebrates from across the Asia-Pacific region. Eskitis is screening these fractions for industry partners and philanthropic organisations to discover new chemical entities for drug development.

Fine particle separation

The Reflux Classifier, an industrial machine used in mining and mineral processing that separates fine particles on the basis of either density or size has been developed at The University of Newcastle in collaboration with **Ludowici**. The technology is now employed in seven countries.

Peak energy demand management

Supported by $1 million from the Queensland Government, Griffith University is working with energy distributors **Energex** and **Ergon**, and manufacturing firm **Elevare Energy** on flattening peak energy demand and helping our power grid infrastructure to deal with distributed renewable energy supplies.

Tidal energy research

Tenax Energy Pty Ltd and Charles Darwin University are creating the world's first tropical environment focussed tidal energy research centre, the T^3C program. T^3C aims to stimulate collaboration in tropical tidal energy generation globally across research institutions and device manufacturers. The testing centre (and associated pilot plant), is the first step towards delivering affordable tidal energy to Darwin by the end of the decade.

Agriculture research

Growing and protecting Victoria's $11.8 b agricultural sector is behind a $288 million joint venture between La Trobe University and the Victorian Government's Department of Environment and Primary Industries that builds on many years of collaboration. The partnership started as a desire to bring together La Trobe's research and the work of DEPI – the largest agricultural R&D organisation in Victoria. A state of the art AgriBio facility at La Trobe's Bundoora campus opened in early 2013.

Research collaborations with health and social service providers

IRU members engage with social and health service providers in similar ways to other industry partners. The ultimate goal is to improve the services to, and outcomes for, patients and clients. This can be achieved, for example, through developing innovative treatments and devices in health care, trialling new modalities and finding efficiencies in service delivery, and translating discoveries in the health and social sciences into practice.

While research is critical to ongoing advances in health and social services, and universities have been engaging effectively with industry colleagues here for a long time, there remain opportunities for enhancing collaboration.

Recommendations in the recent *Strategic Review of Health and Medical Research* call for the building of health and medical research capacity through targeted fellowships, and bringing together researchers, clinicians and other service providers through Integrated Health Research Centres. The IRU endorses these recommendations.

Industry philanthropy and targeted investment is also an important driver of research in health and social services. It is in the interests of industry, as well as government, to invest in a healthier workforce and community. An example of such investment in the IRU is **AFL Victoria's** partnership with La Trobe University. AFL Victoria first commissioned La Trobe University researchers in 2009 to undertake an alcohol policy trial. The relationship has since expanded with additional projects aiming to bring about cultural change in relation to excessive drinking and reducing alcohol-related harms.

Touch screen therapy for the visually impared

Touch screen therapy and assessment software designed at Flinders University has, in collaboration with **Neuro Vision Technology Systems**, been developed into a product used in the treatment of vision impairment due to acquired brain injuries, a condition affecting up to 77,000 Australians each year.

Curing parasitic diseases

Murdoch University, in partnership with Australian drug research company **Epichem** and the Drugs for Neglected Diseases Initiative (DNDi), is investigating infections caused by trypanosome parasites, which cause a range of diseases in developing countries, including Chagas disease, sleeping sickness, and Leishmaniasis. This partnership has resulted in the assessment of a new compound that cures Chagas disease in a mouse model of the disease.

Improving pharmacist delivered health care

The Pharmacy Guild has engaged Griffith University on projects supporting community pharmacists in delivering primary care in mental health and chronic illness, for better and more cost-effective patient outcomes.

Childcare for autistic children

The Victorian Autism Specific Early Learning and Care Centre (Margot Prior Wing) is a joint initiative of the Olga Tennison Autism Research Centre at La Trobe University and the **Royal Children's Hospital**, with Federal funding. Since 2010, the centre has provided long day child care for children with an Autism Spectrum Disorder aged up to 6 years, as well as providing parents with support in a setting that allows for research and learnings to be communicated to families and communities.

Mentoring young leaders

The Young Muslims Leadership Program is a unique education program organised by the Centre for Dialogue in association with the **Islamic Council of Victoria** and La Trobe University. In its third year it aims to support Muslim leaders who can speak clearly and confidently about the various issues which confront people of Islamic faith in Australia today and who can actively participate in shaping Australia's future. Many alumni of the program have taken up leadership roles in the wider community and many also continue to offer their services as mentors in the program.

Patient handovers and treatment regimes

A relationship between the **Peel Health Campus** and Murdoch University's School of Nursing and Midwifery has seen a number of industry and clinically relevant studies undertaken. These include studies into the implementation bedside handovers and treatment regimens for dialysis patients and patients recovering from knee surgery.

Physiology education movies for undergraduates

In partnership with the Gold Coast animation company **3Dme** (Arundel), Griffith University's Health Group has developed two pilot educational movies in the field of physiology. Both are utilised for teaching in Griffith undergraduate courses.

Fertility

University of Newcastle researchers discovered a novel technique for selecting the most viable sperm from ejaculate in the in vitro fertilisation process. The research led to the development of a separating device called the CS10, manufactured in conjunction with multinational life sciences company **NuSep** and launched commercially in 2012. The CS10 has the potential to snare a substantial share of a world market estimated to be worth $100 million annually.

Collaborations in rural and regional Australia

Across all of these broad categories, there are benefits and issues unique to industry-university collaboration in regional and rural Australia. IRU members are national leaders in regional and rural research.

There are challenges specific to regional and rural research collaboration, including a lack of research facilities and infrastructure in regional locations, the geographic distance between researchers and colleagues in industry, and the smaller number of researchers working outside of major cities. Much of this can be alleviated through the use of information and communication technologies to bridge the geographic divide.

However, given the enormous contribution of industry in regional, rural and remote Australia to the nation's economy, enhanced engagement is not only an opportunity for universities and government, it is an imperative. For this reason, it is important that areas of research critical to regional and rural development remain high on the nation's list of research priorities.

It is also important to ensure that young Australians from regional and rural Australia have the same access to university education as those in the city. Regional industries have played a leading role in supporting these students. For example, Bendigo and Adelaide Bank and La Trobe University have a strategic partnership to provide up to 20 new $36,000 scholarships in 2013 to support outstanding students from regional and rural Australia entering university for the first time. The scholarships build on many years of partnership between Bendigo and Adelaide Bank and La Trobe University that includes a youth foundation, MBA scholarships and a community door initiative to allow youth to contribute to their communities.

Biofuels

The International Energy Agency has a goal for biofuels to meet more than a quarter of world demand for transportation fuels by 2050 to reduce dependence on petroleum and coal. Biofuels are emerging as a major field of research in regional Australia.

James Cook University researchers are working with colleagues at **MBD Energy** on the Macroalgal Biofuels and Bioproducts Project. Macroalgae have the potential to supply biofuel and livestock feed and as macroalgae are not produced on arable land the technology does not pose the environmental and food security problems of other biofuel sources such as soy, maize or palm oil.

The University of Newcastle and **Pacific Seeds**, along with other national and international partners are undertaking a research project to produce sorghum cultivars with increased sugar concentration. Such cultivars hold significant potential for use as a biofuel source. The ARC has committed $500,000 towards building a supersized greenhouse to accommodate the plants.

Pearl quality

Researchers at James Cook University partnered with **Atlas South Sea Pearls** on a three year project to identify the genes from oysters responsible for producing high quality south sea pearls. The pearl industry is worth approximately $350 million in Australia, with high quality pearls accounting for 80-90% of profits.

Minimising pesticide residues in grain stock

Murdoch University's Separation Science Laboratory has co-developed, with the **Cooperative Bulk Handling Group**, ResCHEK™. ResCHEK™ is a National Association of Testing Authorities accredited, next-gen residue detection method that offers unparalleled accuracy to ensure that our grain exports are pesticide free. The ResCHEK™ platform can detect more than 150 pesticide residues in a multitude of grain types in less than 24 hours. The fast turnaround, high sensitivity and low cost makes it ideal for exporters in a highly competitive market.

Welder testing

In collaboration with Incospec, and in consultation with the Northern Territory Government, Northern Territory local industry and major project owners, including Inpex and Conoco Phillips, a major upgrade of Charles Darwin University's welder test facility now provides access for all NT companies to improve competency and certify weldersagainst specific national and international standards. The CDU facility is enabling local welders to test for their advanced welder qualification in the Territory. Previously students were required to travel interstate for testing.

Quality assurance in rural, regional and remote medical care

Over the past decade and a half, the largest and most diverse range of pioneering community-based, point-of-care testing by the **Flinders University Rural Clinical School** has been implemented and managed. The most notable program has been the Quality Assurance for Aboriginal and Torres Strait Islander Medical Services Program for diabetes management in Aboriginal medical services across the country.

Protective native plant species in mining areas

Cliffs Mining has contributed to the research of Murdoch scientists who are working to protect and preserve plant species native to areas that are the focus of iron ore mining in Western Australia.

Freshwater Research

The Murray-Darling Freshwater Research Centre (MDFRC) is a multi-disciplinary research centre to ensure healthy and productive aquatic ecosystems in the Murray-Darling Basin. The MDFRC is a partnership between a group of research and policy agencies, including the Murray-Darling Basin Authority, CSIRO Land & Water, La Trobe University and the Department of Sustainability, Environment, Water, Population and Communities.

International collaborations

National borders are not barriers to research collaboration. Advancing information and communication technologies will ensure that international collaborations continue to grow.

There are significant opportunities for growth in international engagement, particularly with partners in rapidly emerging Asian economies. Australia's geographic proximity to, and existing strong trading relationships with Asian nations mean that Australian universities are particularly well placed to service Asian firms seeking entry into Western markets, and vice versa.

A globalised knowledge economy implies global competition for research dollars. To be competitive, Australian universities must respond effectively to the needs of industries and business operating in significantly different environments and with different expectations to local partners.

Australia has established itself as a global leader in the international education services export market. This was achieved through the commitment to international student recruitment within both Australian universities and dedicated government agencies. Universities have been able to significantly expand their international student program both onshore and offshore, particularly in the East Asian region.

Australian university research should be viewed as a vital and commercial export industry similar to education services, and with as much potential for growth. This export market earned more than $16 million for IRU members in 2011. It is important that government services, grants and other support for industry-university engagement are also open to international firms.

The IRU also endorses initiatives that give students greater support to undertake international work experience programs and placements, particularly in Asia. IRU member universities are investigating ways to open the study of diverse Asian languages, including Hindi, Mandarin, Indonesian and Japanese, to students across the network.

New advertising models for emerging media

The Beyond Thirty Seconds (Beyond :30) research program is led by researchers at Murdoch University and uses a lab based approach for investigating new advertising models for emerging media platforms. The project is the gold standard for academic-industry collaboration. Every year, the project's sponsors, who number among the world's leading media networks, advertisers, platforms and technology enablers, gather to shape the project's research agenda. Beyond :30 collaborators have included **Coca-Cola**, **Comcast**, **GM**, **Microsoft** and **Warner Bros**. With over $6 million in funding to date, over 10,000 test sessions have been conducted, resulting in over 5,000 pages of reports across 42 studies.

Robotics

Since 2009 **NEC Corporation (NEC)** and Kyoto University have been in partnership with La Trobe University to design socially and emotionally intelligent systems and technologies. A key project has been the development of NEC's communication robots, with applications in health human resource management, aged-care, education, organisational innovation, travel and tourism. A Melbourne nursing home is using the robots to interact and play games with residents and says the robots improve the quality of life for people with dementia.

Detecting illegal bowling action

The International Cricket Council commissioned Griffith University to develop a monitoring device to detect illegal bowling action. This has since been used at the ICC Under-19 Cricket World Cup. The device provides for early detection and correction of illegal bowling action which is crucial for the development of young bowlers in national and international cricket.

Improving mobile broadband

Ericsson AB of Sweden is working with University of Newcastle researchers, supported by an ARC Linkage Project grant, to improve the performance of the mobile broadband system, a growing imperative with more than four billion mobile phones worldwide and nearly 300 billion emails sent each day.

Rehydrating children with diarrhoea

In partnership with the **Bill and Melinda Gates Foundation** involving the World Health Organisation and **UNICEF**, Flinders University cancer researchers have made major international contributions to the reduction of mortality from severe diarrhoea and its consequences for malnutrition through the substitution of glucose for starch in oral rehydration solutions, a simple change which dramatically shortens the duration of acute episodes of diarrhoea. Diarrhoea is the world's second biggest killer of children under five and is responsible for the death of about 800,000 children every year and leads to malnutrition in millions of others.

Computer engineering

Working with UK based multinational firm **SPTS Technology Ltd**, Griffith University researchers are developing and marketing an industry-standard silicon carbide on silicon (SiC) deposition furnace. Based on a unique process designed at Griffith's Queensland Microtechnology Facility, this technology will allow industry to create novel LEDs, micro-electro-mechanical systems (MEMS) and power systems with higher efficiency and less power consumption at a fraction of the cost of conventional SiC wafers.

Unique applications for nanotechnology

In 2009 **IBM Zurich Research Labs'** collaboration with The University of Newcastle resulted in the Institute of Electrical and Electronics Engineers (IEEE) Control Systems Technology Award for using a unique nanotechnology approach to create what was then hailed as a world record for data storage: 840 gigabits of information on a one square inch computer chip.

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