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**Department of Industry,
Innovation and Science**



How Regional Universities Drive Regional Innovation

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How Regional Universities Drive Regional Innovation

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Foreword

This report examines how regional universities drive regional innovation. Specifically, it is a practical investigation of world best practices, strategies and structures that underpin successful examples of regional innovation sponsored by regional universities.

The rationale for this approach is that, 1) we already have a well developed understanding of the economic fundamentals of Australia's regions^{i,ii,iii,iv,v}, and 2) there are many existing case studies that describe the positive impacts that regional universities have on regional economies^{vi,vii,viii,ix}. However, there is little understanding of the university practices, strategies and structures that underpin these positive impacts. Failure to understand how a system works, not only impedes improvement of the system, it also can lead to invalid conclusions being drawn using crude assessments of outcomes.

For example, some published reports have used macroeconomic indicators to show that regional universities have no impact on regional skilling or regional economic growth^{x, xi}. However the use of this data and the conclusions drawn have been strongly criticised by others^{xii}, in part, on the basis that aggregate data at this level is not sensitive enough to effectively assess the value of regional universities.

This study takes an approach that circumvents the challenges faced by impact assessments using sub-optimal metrics. It also provides a level of insight that cannot be gained from a listing of successful regional impact case studies. This study seeks to understand the prerequisite university structures, strategies and processes that are necessary to underpin university driven regional innovation. It also seeks to understand the factors that are inhibiting effectiveness in this area, leading to a road map that can further build the capacity of regional universities to drive regional innovation.

The organisational knowledge required to address the focus of this work, is distributed across many universities and associated organisations, held by senior managers and executive officers. This project accesses and aggregates that knowledge through one-on-one semi-structured interviews with Deputy Vice Chancellors Research and Directors of innovation offices (or their organisational equivalents) from Australian regional universities, and senior managers from Australian associated organisations ([Appendix 1 - Project Participants Table](#)). This knowledge is augmented with publically available national and organisational data. Data for international comparison and benchmarking was drawn from the USA and South America through interviews with university, industry and government senior managers.

This work demonstrates how successful examples of regional innovation driven by regional universities have been achieved. With this understanding it will be possible to design future policies within organisations and nationally, to better enable universities to drive regional innovation. Through organisational policy development individual regional universities can improve the mechanisms they use to create industry impact. Through national level policy development, the successful strategies of individual universities can be scaled up, for dissemination across a broader range of regional universities.

The survey population

Eight Australian universities having campuses in 29 non-capital city locations, across 24 RDA Regions were surveyed along with eight associated Australian organisations. International comparator organisations included 16 universities, 9 multinational companies and 13 other organisations.

Australian universities were selected based on the location of their headquarters outside of a major metropolitan city. Charles Darwin University and University of Tasmania are exceptions to this selection criterion. Charles Darwin University was included because of Darwin's regional and remote nature despite its capital city status. The University of Tasmania was selected because of Tasmania's remoteness and because of the regional location of the University's Launceston and Cradle Coast campuses. A secondary selection criterion was ensuring a broad distribution of universities across as many Australian States as possible, recognising that Western Australia and South Australia do not have universities headquartered in regional centres.

Associated Australian organisations were selected for their expertise in driving regional innovation and their experience in working with regional universities for this purpose.

International comparison organisations were selected based on their demonstrated success in building university-industry partnerships for innovation, in addition to practical considerations regarding their availability for this project.

Table 0.1: Demographics of Australian Universities surveyed

<i>University</i>		<i>Regional campus locations*</i>	<i>RDA Region / Division</i>	<i>2012 Population by SA3 or LGA Region</i>	<i>2011 Main industries by SA3 or LGA Region***</i>
Charles Darwin University	NT	Darwin**	Darwin	131,938	Public Admin.
		Katherine	Katherine	20,780	Ag.; mining; tourism
		Nhulunbuy	East Arnhem	4,455	Manufacturing
Charles Sturt University	NSW	Albury-Wodonga	Murray	59,591	Manufacturing; Const.
		Bathurst**	Central West	45,452	Manufacturing
		Dubbo	Orana	69,812	Agriculture
		Goulburn	Southern Inland	70,769	Ag.; Trans.; Mining
		Orange	Central West	57,245	Mining; Agriculture
		Port Macquarie	Mid North Coast	76,037	Manufacturing; Energy
		Wagga Wagga	Riverina	92,580	Ag.; Defense; Transport
		Wangaratta	Hume	44,770	Manufacturing; Trans.
Federation University Australia	Vic	Ballarat**	Grampians	99,110	Manufacturing; ICT
		Gippsland	Gippsland	43,279	Dairy; Agrifood manuf.
		Horsham	Grampians	19,658	Manufact.; Construct.
		Ararat	Grampians	8,196	Manufacturing
		Stawell	Grampians	8,319	Agriculture
James Cook University	Qld	Townsville**	Townsville	184,768	Public Admin; Defence
		Cairns	FNQ	151,121	Tourism; Ag.; Mining
		Mackay	Mackay Issac Whitsunday	119,080	Mining; Ag.; Tourism
		Mt Isa	North West	22,682	Mining
		Thursday Island	Torres Straight	3,700	Public Admin; Fisheries
Southern Cross University	NSW	Lismore**	Northern Rivers	44,485	Ag.; Food manufact.
		Coffs Harbour	Mid North Coast	82,246	Agrifood; Tourism
University of Southern Qld	Qld	Toowoomba**	Darling Downs	146,547	Ag.; construct.; trans.
		Ipswich	Ipswich and West Moreton	177,485	Defence; Edu.; trans.

University of Tasmania	Tas	Hobart**	Hobart	50,342	Marine; tourism;
		Launceston	Launceston	82,842	Agrifood;
		Burnie	Burnie	50,089	Agrifood; Mining.
University of the Sunshine Coast	Qld	Sunshine Coast**	Sunshine Coast	324,266	Tourism; Retail; Edu.; Prof. serv.

Notes:

* Excludes minor 'Study Centres' and secondary metropolitan campuses.

** Location for university headquarters.

*** Qualitative information from local government, state government or RDA, because universally reported employment metrics unfairly bias results towards health care.

Summary of conclusions

Conclusion 1.1: It is necessary to recognise the defining characteristics of individual universities, irrespective of their location within or outside of an Australian capital city.

Conclusion 1.2: Having many regional campuses increases the economic resilience of regional universities and allows them to diversify their focus without diminishing their local regional relevance.

Conclusion 1.3: Colocation of research activity with regional industry practitioners and stakeholders through regional campuses is a strong driver of regional business innovation.

Conclusion 1.4: Colocation of research activity with regional industry practitioners and stakeholders should be given consideration as a measure of strong research capability.

Conclusion 1.5: Peri-capital city campuses give regional universities a competitive advantage in attracting businesses as tenants on their campuses.

Conclusion 1.6: Peri-capital city technology parks have locations that are uniquely attractive to entrepreneurs who are establishing or growing micro-enterprises.

Conclusion 1.7: Pursuing a strategy of establishing capital city campuses gives regional universities increased economic resilience, without degrading their regional connectivity and focus.

Conclusion 1.8: Regional universities maintain strategic focuses that are relevant for their communities, and support business innovation within their communities.

Conclusion 2.1: The Australian Government university funding formula inhibits university engagement with industry, impeding research that leads to industry impact.

Conclusion 2.2: Universities that are strongly focused on the pursuit of excellence can be hesitant to incentivise researchers to engage with industry.

Conclusion 3.1: Regional Australian universities are well placed to drive innovation in their local communities and maintain a concurrent global vision.

Conclusion 3.2: International missions are an effective tool to overcome geographical remoteness and engage face-to-face.

Conclusion 3.3: Schemes that build on the success of the ACSRF Group Mission scheme would be effective means to sponsor international industry engagement.

Conclusion 3.4: A review of the outcomes of the ACSRF Group Missions scheme might assist in the development of more effective mechanisms to support the export of Australian innovation.

Conclusion 4.1: Regional environments dictate that regional universities each specialise in distinctive research areas of strength, rather than attempt to maintain comprehensive research expertise.

Conclusion 4.2: This region specific specialisation of regional universities is linked to the industry of each region, strengthening the ability of regional universities to contribute to regional innovation.

Conclusion 4.3: Where regional specialisation lacks the breadth to approach broad industry challenges, regional universities are collaborating to pool their capability across a broader range of specialties.

Conclusion 5.1: There is a disparity between regional university and industry perspectives on innovation, leading to a sub-optimal engagement between these sectors.

Conclusion 5.2: Rather than using discussion forums as a primary focus for industry engagement, discussion needs to be embedded within functional activities that industry values.

Conclusion 6.1: Having ties to their local regions and industries, researchers at regional universities typically have a good competency for industry engagement.

Conclusion 6.2: Regional universities are challenged by the need to retain industry competent professional staff, who are often lost to metropolitan workplaces.

Conclusion 7.1: Regional universities have an important role in skilling regional workforces.

Conclusion 7.2: Teaching at regional universities can also act as an icebreaker for further university-industry engagement for innovation.

Conclusion 7.3: University Centres are an interesting form of industry demand-driven tertiary education, having relevance as a mechanism for university-industry engagement.

Conclusion 8.1: University research positioning with industry for future engagement is an important outcome of consulting and contract research activity, over and above immediate cash income.

Conclusion 8.2: It is a challenge for universities to provide researchers with cash incentives to undertake consulting and contract research because universities themselves receive little cash incentive to undertake this work.

Conclusion 8.3: Many regional universities are committed to using consulting and contract research for research positioning.

Conclusion 8.4: The delivery of service activities such as agricultural extension services and business advisory services, could be a useful tool to seed university/industry engagement in Australia, as it does overseas.

Conclusion 9.1: Technology transfer at regional universities is a marginal activity, challenged by small IP portfolios and the innate high risk and cost of technology transfer.

Conclusion 9.2: A central agency for technology transfer is universally viewed as a sensible possible solution to the challenge of technology transfer across a wide range of innovation providers.

Conclusion 9.3: Any proposed agency needs the impartiality to work across many innovation providers, and the flexibility to work with industry.

Conclusion 10.1: The industry-linked funding schemes of Australia's two major academic granting bodies (ARC and NHMRC) are not effective for engagement between regional universities and regional businesses.

Conclusion 10.2: It is important to find ways to support the antecedents of sustained university-industry engagement, outside of the confines of specific research programmes.

Conclusion 10.3: The CRC Programme, the Entrepreneur's Programme, and the previous Researchers in Business, CRN and ACSRF Group Missions schemes have successfully supported the building of sustained university-industry partnerships.

Conclusion 11.1: University seeded industry cluster engagement is a gateway to future sustained university-industry cross-sectoral engagement.

Conclusion 11.2: The lack of broad based activity in this area, and the lack of funding for this activity in Australia perhaps contributes to Australia's limited university-industry engagement for business innovation.

Conclusion 12.1: National business plan competitions are a low cost and effective mechanism to focus and stimulate entrepreneurship training across many universities.

Conclusion 12.2: It is beneficial to deliver entrepreneurship training in a region specific context, this is a particularly important factor for consideration by Australian regional universities serving diverse student populations.

Conclusion 12.3: There is little existing consistency among regional universities for the delivery of entrepreneurship training to students or staff.

Conclusion 13.1: Having a senior executive leader who is responsible for engagement is an essential component of a streamlined structure for engagement with industry. It is an indicator that a university has seriously considered how it should drive innovation and it might be one predictor for future success in driving regional business innovation.

Conclusion 13.2: Having a single coordinating centre or unit to oversee whole of university engagement is an effective response to the need for industry to see a single coordinated point of entry into a university.

Summary of strategies to drive regional innovation

Focus Area 1 — University responses to economic diversity between regions

Strategy 1.1: Multiple regional campus strategy

Strategy 1.2: Peri-capital city campus strategy

Strategy 1.3: Capital city campus strategy

Strategy 1.4: Regional strategic focus strategy

Focus Area 2 — Reconciling academic excellence and industry impact

Strategy 2.1: University block funding and industry funding

Focus Area 3 — Overcoming geographic remoteness

Strategy 3.1: Local focus (with global vision)

Strategy 3.2: International missions

Strategy 3.3: Third party forums

Focus Area 4 — Serving regional innovation through specialisation

Strategy 4.1: Critical mass within flagship areas

Strategy 4.2: Collaborative gain

Focus Area 5 — Local industry participation

Strategy 5.1: Looking beyond discussion forums

Focus Area 6 — Regional university workforce competency for industry engagement

Strategy 6.1: Researchers work within regions, for those regions

Focus Area 7 — Using teaching to drive regional innovation

Strategy 7.1: Retaining school graduates and skilling workforces within regional areas

Strategy 7.2: Regional training as a pathway to regional innovation

Strategy 7.3: Industry driven university teaching

Focus Area 8 — Using CCR for regional innovation

Strategy 8.1: Flexible CCR policies

Strategy 8.2: Researcher incentives to undertake CCR

Strategy 8.3: Agriculture extension services

Strategy 8.4: Business innovation services

Focus Area 9 — Using technology transfer for regional innovation

Strategy 9.1: A national agency for technology transfer

Focus Area 10 — Using industry sponsored grants for regional innovation

Strategy 10.1: Funding to support sustainable university-industry engagement

Strategy 10.2: The Collaborative Research Network Scheme

Strategy 10.3: The Australia-China Strategic Research Fund – Group Missions

Strategy 10.4: The Cooperative Research Centres Programme

Focus Area 11 — Using cluster engagement for regional business innovation

Strategy 11.1: Government seeded industry clusters

Strategy 11.2: University seeded industry clusters

Focus Area 12 — Student and staff entrepreneurship

Strategy 12.1: Specific undergraduate courses with entrepreneurship content

Strategy 12.2: Staff industry fluency programmes

Strategy 12.3: Social entrepreneurship programmes

Strategy 12.4: Business plan competitions

Focus Area 13 — Streamlined university structures for regional engagement

Strategy 13.1: Senior leadership for engagement

Strategy 13.2: A coordinating centre for engagement

Focus Area 1 — University responses to economic diversity between regions

1.1 Background

Many detailed analyses of Australia's regional economies already exist contributing to our significant understanding in this area. Focus Area 1 builds on this existing knowledge and is concerned with understanding how regional universities are differentiated and diversified as a result of their regional economic environments.

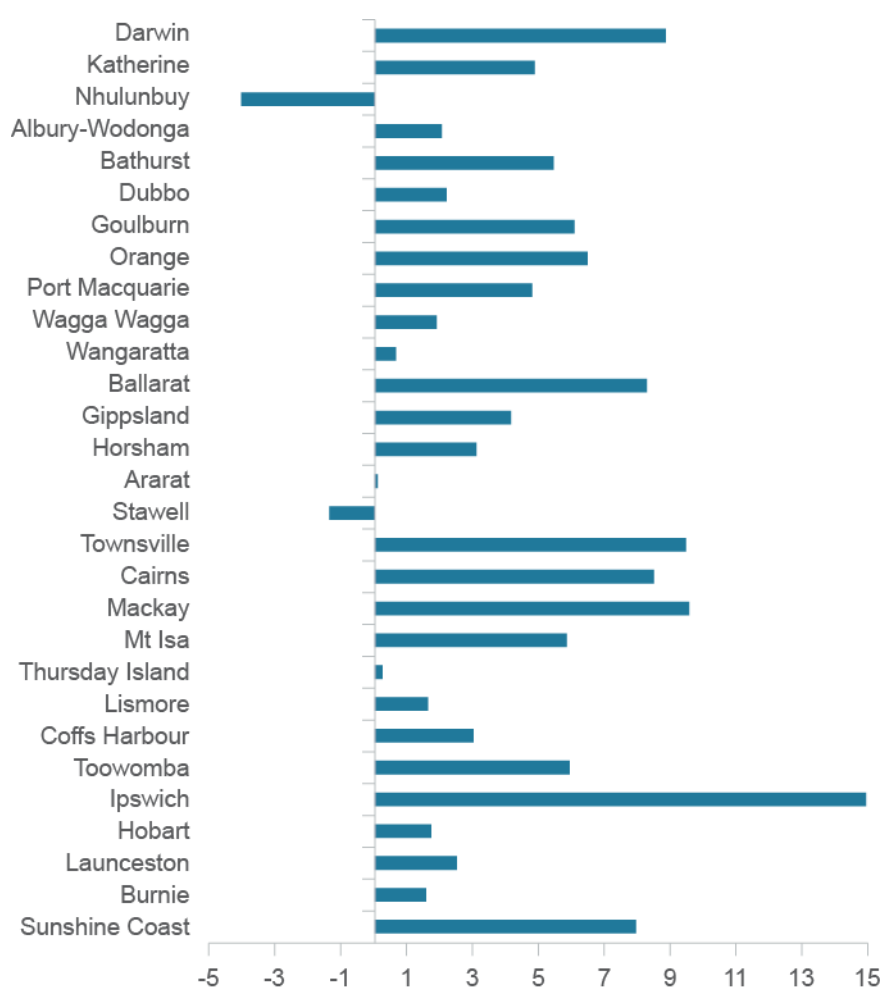
***What successful strategies do universities** employ to function within a diverse range of regional economies and how does this help them serve regional innovation **better**?*

1.2 Findings

Regional economic growth

The perception of most interviewees was that there is overall economic growth in their local economies, primarily due to population growth in their regions. 2013-2014 ABS data^{xiii} supports this qualitative view, showing population growth from 2008 - 2012 in all but two of the regions analysed in the project. More broadly, ABS data demonstrates population growth across most Australian regional centres, with regional population declines limited only to more remote areas such as Nhulunbuy, as seen in Figure 1.1.

Figure 1.1: Five year % population change, 2008 – 2012



Notes: shows population changes over five years to 2012 in the 29 regions associated with the campuses of the surveyed regional universities. Compiled from Australian Bureau of Statistics data^{xiv}

Regional economic stability

Interviewees in regions with diverse economies reported greatest regional economic stability. Regions that were perceived by interviewees to lack this stability were the Cairns region, due to the volatility of its dominant tourism sector, and the Murray-Darling region, dominated by agriculture and perceived by some to have been impacted by water allocation restrictions. In the Cairns region, these views are supported by a 2014 regional resilience study^{xv} that has reported:

“...Base industries for Cairns regional economy which earn income outside the region face economic pressure due to changing global and national markets and are subject to external economic conditions (e.g., exchange rates, GFC). For Cairns these include the tourism, marine, aviation, agriculture, government and defense sectors. There is a fair bit of variability from time to time in those industries.”

More broadly, the importance of population growth and economic diversity for economic stability is widely established, as described in a 2011 HC Coombs Policy Forum Discussion Paper^{xvi} on Australian regional economic stability.

Peri-capital city economic activity

Universities in regions surrounding capital cities commented on the importance of capital city economic activity spilling out to the surrounding regions. For example, service industry businesses in peri-capital city areas can benefit from lower business costs and favorable lifestyle factors and still service large metropolitan markets. This economic characteristic distinguishes peri-capital city universities quite markedly from universities that are more geographically isolated from major capital cities.

Metropolitan economic activity

Basic market economics indicate that having access to larger student markets is economically beneficial for universities. Melbourne, Sydney and Brisbane are portals to large domestic and international student markets. The rapid expansion in capital city campuses of regional universities indicates the value of establishing these campuses in Melbourne, Sydney, Brisbane and overseas.

1.3 Analysis and Conclusions

What is a regional university?

Historically there has been no universal agreement on what constitutes a regional university^{xvii}, however it is sometimes considered convenient to aggregate universities based on gross characteristics such as location outside of a capital city. This categorisation is complicated by the existence of metropolitan headquartered universities with regional campuses and regionally headquartered universities with metropolitan campuses. Superficially, regional universities may share some common characteristics, however superficial conceptions of a 'regional' university can distract from identifying organisation-specific qualities that drive innovation. Yale University is an excellent example of this error.

International Perspective: What is a regional university?

Yale is a regional U.S. university. This statement is valid given Yale's two-hour dislocation from major cities. However categorising Yale on the basis of its non-metropolitan location has little value since its focus and performance are primarily driven by its special organisational characteristics.

Conclusion 1.1: It is necessary to recognise the defining characteristics of individual universities, irrespective of their location within or outside of an Australian capital city.

Interviewees in this study described many ways in which their universities have become differentiated in order to functionally integrate with their local economies, and maintain a global outlook. The best practices, strategies and

structures listed below, underpin successful responses to economic diversity between regions.

Multiple regional campus strategy

The regional universities in this study each host up to eight regional campuses. Some of the universities also operate secondary metropolitan campuses, overseas campuses and smaller remote 'study centres' and facilities for distance learning. In contrast it is not common for metropolitan headquartered universities to operate so many campuses across locations with such geographical separation.

This multi-campus strategy allows regional universities to act locally across many regions, increasing their resilience to local economic weakness in any single region. In relation to their capability to drive regional innovation this has two consequences:

- Their physical presence across many diverse economies allows regional universities to diversify their strategic focus areas and still remain engaged with the people, businesses and economies of their local communities. For example: Charles Sturt University holds focused expertise across 10 research centres or institutes, however these focus areas are located across different regions that have industry relevance for their focus areas^{xviii}. For example, one of these focuses is viticulture research. Charles Sturt University's National Wine and Grape Industry Centre is located in Wagga Wagga, a grape growing region with seven wineries and breweries open to the public^{xix}. This Industry Centre is also co-located with the NSW Wine Industry Association and the NSW Department of Agriculture. The geographical proximity between government, university and industry sector stakeholders in wine, within a wine region, is a powerful driver for business innovation. Examples such as this, of co-alignment between university focus areas and local industry strength are common among regional universities. Regional universities with multiple regional campuses can demonstrate their capacity in this regard, perhaps better than metropolitan universities that are isolated from the people and businesses that matter in a regional industry. This may explain why Rural Research Development Corporations (RDCs) sometimes express a preference for working with regional universities.
- Colocation of university strengths with local industry strengths, driven by a multiple regional campus strategy, should be given serious consideration as a measure of research capability, besides the more generally accepted academic measures such as publications in highly cited international journals and Australian Competitive Grant (ACG) granting track record.
- Their physical presence across many regionally separate locations also allows regional universities to access broader student markets and increase income from student fees. This is important for their research missions and their capability to drive innovation because in Australia, analysis of university budgets shows that the cost of university research is heavily subsidised by student income^{xx}. Universities with high growth in student numbers are able to commit more funds to research. A current strong example of this in Australia, is the Australian Catholic University, which is a

multi-state metropolitan university (not regional and not surveyed here). Australian Catholic University has doubled its student population in recent years^{xxi}, allowing it to commit a large strategic budget to developing its research performance.

Peri-capital city campus strategy

Four of the eight universities in this study could be described as having a peri-

Conclusion 1.2: Having many regional campuses increases the economic resilience of regional universities and allows them to diversify their focus without diminishing their local regional relevance.

Conclusion 1.3: Colocation of research activity with regional industry practitioners and stakeholders through regional campuses is a strong driver of regional business innovation.

Conclusion 1.4: Colocation of research activity with regional industry practitioners and stakeholders should be given consideration as a measure of strong research capability.

capital city campus, located approximately one hour from Brisbane, Sydney or Melbourne. This type of regional location generates unique opportunities that support regional innovation. For example, Federation University Australia (FUA) in Ballarat, and the University of the Sunshine Coast (USC) are both associated with successful technology parks. Technology park success is poorly understood and not always achieved. However, the surveyed universities show that business attraction through technology parks is a strong driver for business innovation through university-industry colocation. Both parks draw strength from their peri-capital city locations.

- In the case of Ballarat, FUA's peri-capital city campus location was able to attract IBM as an anchor tenant, on the basis that Ballarat offered lower business costs and an attractive small-town lifestyle, still within reaching distance of Melbourne's services and employment market. From the Ballarat Technology Park, IBM has been delivering ICT services for over 20 years, with a capacity for up to 1000 staff, delivering services to markets that lie outside of Ballarat.
- In the case of the Sunshine Coast (USC), USC's peri-capital city campus is shared with the Innovation Centre Sunshine Coast (ICSC) - a technology park. This location is attractive to ex-Brisbane-based entrepreneurs who are looking for a coastal lifestyle to create new enterprises, but still within servicing distance of Brisbane. The tenant list of ICSC is dominated by micro and small to medium sized enterprises delivering services to Brisbane and beyond. This indicates that peri-capital city technology parks may have a unique and important function in business innovation, which is distinct from the function of capital city technology parks

Conclusion 1.5: Peri-capital city campuses give regional universities a competitive advantage in attracting businesses as tenants on their campuses.

Conclusion 1.6: Peri-capital city technology parks have locations that are uniquely attractive to entrepreneurs who are establishing or growing micro-enterprises.

Capital city campus strategy

Five out of the eight surveyed universities have established campuses within Melbourne, Sydney, Brisbane, or capital cities overseas (Ontario and Singapore). This campus strategy increases access to domestic and international student markets^{xxii}, increasing the capability of regional universities to grow income from student fees.

University	Capital City Campuses
CDU	Melbourne; Sydney
CSU	Canberra; Sydney; Melbourne; Ontario
JCU	Brisbane; Singapore
SCU	Sydney; Melbourne
UTas	Sydney

This strategy has been criticised as an unnecessary duplication of tertiary education services in capital cities, which are adequately serviced by major metropolitan universities^{xxiii}. However, this criticism fails to take into account the value of these campuses as financial support mechanisms for the regional universities. Metropolitan footprints for regional universities contribute to providing the income for regional teaching and business innovation activities, while their regional footprints maintain trust, reputation and engagement with collocated regional businesses.

Conclusion 1.7: Pursuing a strategy of establishing capital city campuses gives regional universities increased economic resilience, without degrading their regional connectivity and focus.

Regional strategic focus strategy

All university interviewees recognised the absolute requirement for regional universities to be focused on a few areas of relevance, rather than hold expertise across a comprehensive range of broad areas. Furthermore they articulated the importance of matching their focus with the needs of their local communities. The research plans of each of the surveyed universities confirm that this strategic intent is implemented across the teaching, research and service missions of these universities. A strategic focus on local regional issues builds trust and respect within regional communities because those communities can see the relevance of the university for their needs.

Conclusion 1.8: Regional universities maintain strategic focuses that are relevant for their communities, and support business innovation within their communities.

2. Focus Area 2 — Reconciling academic excellence and industry impact

2.1 Background

Academic excellence is a key aspiration for all Australian universities. Measures of academic excellence such as high quality publications and Australian Competitive Grant (ACG) income are the primary drivers for success in the Australian ERA university rating system, and also for international ranking systems such as the pre-eminent Shanghai Jiao Tong ARWU. Most importantly these measures of academic excellence drive the Australian Government's calculations for Block Grant Allocations to universities.

Put simply, smart organisations follow the cash, and Australian universities are directly financially rewarded for producing high quality publications and securing ACG income.

International Perspective: Industry valuation of academic excellence

"Why do *you guys* insist on being world class? We want relevance"

*A comment from a manager of university collaborations
Siemens Corporate Research*

However, industry engagement leading to business productivity does not necessarily contribute to currently recognised measures of academic excellence. Therefore it is argued by many that Universities are not driven to engage with industry and therefore their contribution to business innovation is inhibited. In fact many international studies on this subject have shown that organisations with higher academic excellence have lower levels of participation with industry^{xxiv, xxv, xxvi}. Australia is internationally renowned for the high level of excellence demonstrated by our universities. As an example, 16 of the World's top 100 universities under the age of 50 are Australian^{xxvii}. On a per capita basis this represents extraordinary excellence. On this basis, should we be surprised that Australia struggles with university-industry engagement?

"A culture of innovation is absent in large parts of the academic research sector of Australia. There is little contact with industry, role models for moving ideas out of the academic environment are rare, and therefore few industry players are interested in partnering with universities."^{xxviii}
Nobel Prizewinner Brian Schmidt AO, 2014

There has been broad and detailed public discussion on the need to recognise innovation and industry impact as an important outcome of university activity, and about building this recognition into the Australian Government's university block funding formula^{xxix, xxx, xxxi}.

There has also been much work on the design and implementation of measures of impact to provide a quantitative basis for recognising university activity in this area. The use of impact studies in the United Kingdom's Research Excellence Framework is possibly the most mature international example for the use of measures of impact to determine levels of university funding^{xxxii}. In Australia, the national debate continues on the accuracy of using impact metrics as measures

of the role universities play in industry innovation. Land and Water Australia undertook a measurement of 20 years of investment in natural resource management^{xxxiii}. Also the Australian ATN and GO8 networks of universities undertook an 'Excellence in Innovation for Australia (EIA) Impact Assessment Trial'^{xxxiv,xxxv}. Hopefully resolutions can be found for major challenges to this impact assessment approach including: time lags to impact; contribution and attribution of inputs; assessment at the margin; and transaction costs of assessment.

Excellence driven funding in addition to a preoccupation with Academic rankings, create a bind that focuses universities on academic excellence rather than industry driven research. To quantify "who is the best?", creates a problem for achieving impact and a distraction that has little importance for industry.

2.2 Findings

University block funding

In accord with the national debate outlined above, interviewees overwhelmingly expressed the need for industry impact and its prerequisite activities to be factored into the Australian Government block funding formula for universities. Some interviewees specifically noted that the current funding formula is a disincentive for universities to undertake industry driven research.

Industry funding

All surveyed universities reported that industry linked research funds are an important source of income. Furthermore, three of the universities specifically highlighted that traditional Australian Research Council (ARC) and National Health and Medical Research Council (NHMRC) funding is not a large component of their research income and therefore is not the most important driver for their strategic planning. In Figure 2.1, data from the 2013 Australian Government Higher Education Research Data Collection (HERDC) return validate these statements, showing that relative to total university research income, the percentage of industry income to regional universities is twice as high as the elite GO8 universities. Conversely the percentage of Commonwealth ACG (e.g. ARC and NHMRC) funding to GO8 universities is higher than regional universities.

Pursuing measures of excellence

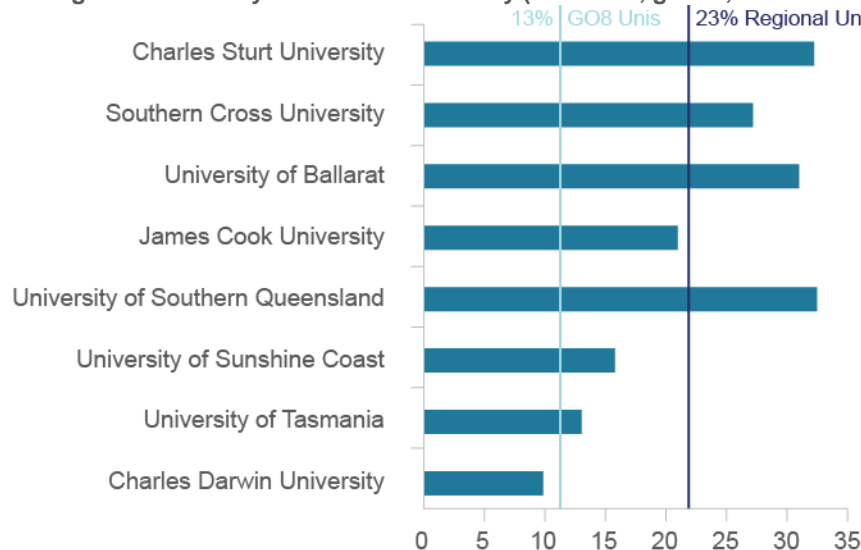
The many university interviewees indicated that striving for measures of excellence such as high quality publications and ARC or NHMRC grants, was to some extent in conflict with pursuing industry engagement for industry impact. Three universities commented that capacity constraints of individual researchers were an underlying factor for this conflict. It was noted that the most successful researchers could build large research teams (with post-docs, research assistants and postgraduates) creating capacity for both academic and industry activity. However, many lone researchers did not have the capacity to operate effectively in both of these spheres, in addition to bearing significant teaching and administrative workloads. These capacity constrained researchers have greater pressure to choose between consultancy oriented work that often

responds to local needs, and competitive grants that require a more global outlook.

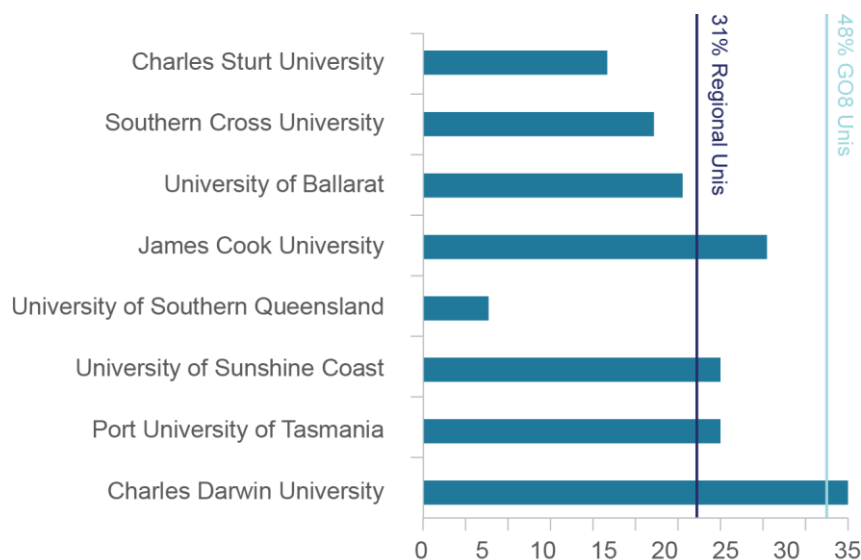
Deputy Vice Chancellors from two of the surveyed universities indicated that they were hesitant to encourage researchers to engage in consulting work with industry where this might detract from the pursuit of ACG income.

Figure 2.1: 2013 HERDC data for regional universities compared with the GO8 average^{xxxvi}

% Regional University income from Industry (contracts, grants, non-uni CRC)



% Regional University income from ACG (Commonwealth) Schemes



Note that in the 2013 HERDC database, Federation University Australia is referred to by its previous name, University of Ballarat

Conclusion 2.1: The Australian Government university funding formula inhibits University engagement with industry, impeding research that leads to industry impact.

Conclusion 2.2: Universities that are strongly focused on the pursuit of excellence can be hesitant to incentivise researchers to engage with industry.

2.3 Analysis and Conclusions:

University block funding and industry funding

All regional universities have structures, strategies and practices in place to incentivise staff to engage with industry and encourage industry to engage with universities. Furthermore, Australian and international examples exist, for the funding of university-industry engagement leading to business innovation. These strategies are the focus for analysis and discussion in all further Focus Areas of this report.

However, the excellence driven formula that dictates university block funding presents a major challenge for all universities and is currently an important inhibitor for university-industry engagement. Strategies to resolve the challenges regarding university block funding and financial disincentives for industry engagement must be handled nationally, and there is broad national discussion on this topic currently. In particular *“the development of simpler, more transparent research block grant arrangements which continue to focus on quality and excellence, support greater industry and end-user engagement, and better knowledge transfer with industry”* is one of the terms of reference announced for the Watt Review, a 2015 Department of Education and Training, Review of Research Policy and Funding Arrangements^{xxxvii}. Further detailed discussion on university block funding is beyond the scope of this report.

Future use and abuse of impact metrics

Any discussion about funding mechanisms that support industry impact appear to be followed immediately by discussion of impact metrics. Logically, if funding universities to have industry impact is important, then assessing how well universities will undertake this activity in future is essential. However, using historical metrics that measure past performance for industry impact, is not necessarily an accurate way to predict future performance.

The use of track record metrics for assessing research excellence is well excepted by universities, although it is not without its flaws. However, Australia has not yet used track record metrics to assess the ability of universities to create industry impact. This approach is confounded by the very long time period that can elapse before impact is realised, and the very wide variety of possible impacts. Put simply, if the impact of a university is a result of research activity that occurred 20 years ago, is this impact an accurate measure of the university's current performance? This question is particularly difficult to answer when one realises that the researchers responsible for the research may very

well be currently working at another university. The recent GO8 EIA Impact Assessment Trial correctly highlighted time lags to impact; contribution and attribution of inputs; assessment at the margin; and transaction costs of assessment as challenges that need to be overcome. However, that trial did not propose any detailed strategies to overcome these challenges.

One strategy may be the identification of mechanisms for industry engagement, rather than an assessment of prior track record. If the desired industry impact is known, and there are known mechanisms to achieve this impact, then it should be possible to make funding for industry impact contingent upon use of these mechanisms. This approach overcomes the previously highlighted challenges and requires universities to actively engage with industry using proven successful mechanisms.

3. Focus Area 3 — Overcoming geographic remoteness

3.1 Background

Australia is a very long distance from anywhere of global significance to innovation. Geographical remoteness imposes challenges for all Australian universities, metropolitan and regional alike. However this challenge is particularly complex for regional universities because they must achieve global reach and significance at the same time as maintaining local focus and relevance.

3.2 Findings

A resolvable challenge or a deal-breaker?

International Perspective: The two hour challenge.

When interviewed, the Managing Director of the Yale Office of Cooperative Research, referred to a “two hour challenge”, inferring that if a potential partner is located more than two hours away, then engagement is exceptionally difficult due to the importance of face-to-face communication and the need for overnight travel to accommodate this.

Conversely the Manager of University Collaboration at Siemens Corporate Research said that distance is irrelevant, Siemens works with the most relevant organisations, wherever they might be.

Furthermore, a Senior Manager at Lockheed Martin Corporation noted a recent corporate policy for engagement with preferred organisations, irrespective of distance.

Lastly Ikiam University, a flagship university in Ecuador is purposefully being built in the Amazon region (a region with few students or teachers, no major companies and minimal infrastructure), in part to take advantage of the global visibility of the Amazon and the unique global engagement opportunity this creates, despite its geographic remoteness and associated challenges.

The specific challenge for regional universities

All surveyed universities reported that geographical isolation is a challenge. However responses differed as to whether this challenge was specific to regional universities, or common to all Australian universities. Strategies to address this challenge varied greatly.

One university reported that virtual communication was their primary means to overcome geographic remoteness. One university stated that virtual communication is insufficient. This university invests significantly in tightly focused overseas travel for senior managers to engage with specific key large industry partners. Most universities address the challenge using a mix of travel for face-to-face engagement supported by virtual communication.

Importantly, one university highlighted that local industry engagement is of critical importance for regional universities, therefore regional universities have

no geographical separation regarding that critical purpose. Furthermore, metropolitan universities might in fact be considered 'remote' to the needs of regional business.

3.3 Analysis and Conclusions

Local focus (with global vision)

On reflection, the challenge for regional universities in relation to geographical remoteness, is better expressed as a dual challenge to sustain local focus and global vision concurrently. It could be argued that regional universities are the best placed of all Australian universities to do this. Firstly, they are collocated with local industry in regional communities, serving their needs as informed and engaged local partners. From a regional perspective, it is metropolitan universities that suffer from geographical dislocation from regional stakeholders and their needs.

Secondly, regional universities have the same opportunities as any Australian university to break down international barriers to engage with key markets overseas. For instance, few of the overseas companies or World top 100 universities engaged in this study understood or even cared that there is a difference between The University of Queensland and the University of Southern Queensland. We are all antipodean to them and the threshold for recognition of demonstrated capability is equally high for all.

The dual local and global positioning of regional universities permits them to entertain strategies that drive local business innovation, and strategies that plug regionally generated innovations into global markets.

Conclusion 3.1: Regional Australian universities are well placed to drive innovation in their local communities and maintain a concurrent global vision.

International missions

One of the surveyed universities described a successful relationship with a major U.S. agricultural company, whereby an initial targeted mission to the U.S. had matured into an ongoing relationship supported by further regular missions to the U.S. This strategy of face-to-face engagement requiring overseas travel is viewed by that university as being essential for the collaboration. This is also a strategy that is recommended by managers from numerous U.S. companies engaged in this survey. However, at many Australian universities the expense, logistical complexity, and perceived risk of international delegations are seen as high barriers to overcome.

A previous Department of Industry and Science funding scheme named the Australia-China Science and Research Fund (ACSRF) – Group Missions scheme, supported this type of international delegation activity. The eight regional universities surveyed in this study received 16% of the 87 grants awarded over three years. In the opinion of the Chief Investigator, the scheme

requirement of 2 submissions (maximum) per university was instrumental to ensure that the sheer volume of submissions from larger metropolitan universities did not swamp regional university applications. This was an important factor to ensure that the scheme supported innovation associated with regional universities and their regional industry partners. It was also noted that an exclusive China focus and total three-year disbursement of approximately \$3.2 million dollars constrained the potential impact of this scheme.

Table 3.1: Successful Group Missions grants from the Surveyed Regional Universities

University	ACSRF Group Missions project title
Southern Cross University	<p>Collaboration with Beijing University of Technology in e-health research.</p> <p>Collaboration with Tianjin University of Sport and partners to promote animal welfare and performance in the race horse industry.</p> <p>Development of a strategic collaboration between Zhejiang University and Huazhong Agricultural University in major food crop seed grain composition and nutritional quality.</p>
University of Ballarat	Collaboration with the Nanjing Institute of Geography and Limnology Chinese Academy of Sciences (NIGLAS) to develop a China Australia Floodplain Wetland Network research partnership.
University of Southern Queensland	<p>Collaboration with Nanjing University on research partnerships in climate science, agricultural systems and sustainable water resources.</p> <p>Collaboration with Zhejiang University on future materials and composites.</p>
University of the Sunshine Coast	<p>Collaboration with the China Eucalypt Research Centre on disease resistance screening to protect trees from eucalyptus rust and other pathogens.</p> <p>Collaboration with the Beijing Genomics Institute to strengthen genomics research capacity.</p> <p>Collaboration with East China Normal University to boost subtropical planted forests carbon stock and timber via soil amendment of biochar.</p>
James Cook University	<p>Strategic collaboration with the Institute of Soil and Water Conservation, Chinese Academy of Sciences and other collaborators on new models for flood forecasting and water management.</p> <p>Strengthening Collaboration with Tianjin University on Dental Ceramic Fabrication and Characterization.</p> <p>Collaboration with Wenzhou Medical College to explore treatment mechanisms for orthodontic management of periodontal diseases in adult and aged population.</p>
Charles Sturt University	<p>Bilateral collaboration with the University of Shanghai for Science and Technology in the field of forensic computing.</p> <p>Collaboration with Harbin Institute of Technology in the field of computer-enhanced surgical systems.</p>

Notes: Table 3.1 identifies the surveyed regional universities that received funding from the ACSRf Group Missions scheme. Project titles with obvious specific regional focus are highlighted in bold.

Third party forums

One interviewee identified industry forums that are hosted by third parties, as important platforms for regional researchers to gain industry profile. It is typical for universities to attempt to attract industry on campus for university branded profiling events. When geographical remoteness limits this on-campus activity, use of third party hosted forums is an effective mechanism to engage with end users from industry, government and other sectors.

Conclusion 3.2: International missions are an effective tool to overcome geographical remoteness and engage face-to-face.

Conclusion 3.3: Schemes that build on the success of the ACSRF Group Mission scheme would be effective means to sponsor international industry engagement.

Conclusion 3.4: A review of the outcomes of the ACSRF Group Missions scheme might assist in the development of more effective mechanisms to support the export of Australian innovation.

4. Focus Area 4 — Serving regional innovation through specialisation

4.1 Background

There has been extensive national and international discussion regarding the nature and value of universities, as teaching institutions, as research organisations, and as innovation providers. The traditional view of a comprehensive, research intensive university, as having research excellence in all areas has evolved into a recognition of the importance of organisational distinctiveness and differentiation. Diverse systems possess greater stability, and there is a growing consensus that institutional differentiation within the Australian higher education system is a desirable goal. Mission-based compacts^{xxxviii} between the Australian Government and universities, covering operations from 2014 – 2016 are a tangible outcome of an emerging recognition that each university is an autonomous institution with a distinctive mission.

The differentiation in research capability of regional universities serves industry innovation by tailoring the focus of innovation providers within a region, to cater for the needs of industry also within that region.

4.2 Findings

Regional specialisation

No interviewed Deputy Vice Chancellor Research (or equivalent) expressed any intent to build research expertise across a comprehensively broad range of fields. Maintaining comprehensive research excellence across a diverse range of fields was accepted as being out of scope for all but the largest of universities. All surveyed universities universally recognised the absolute need to specialise in order to create critical mass within a limited number of flagship areas.

Synergistic collaboration

It was also reported that a number of universities within the Regional Universities Network are pooling their capabilities to present a broader synergistic range of expertise in response to specific industry challenges.

4.3 Analysis and Conclusions

Critical mass within flagship areas

The commitment showed by Deputy Vice Chancellors Research towards organisational specialisation is reflected in the number of areas of strength that regional universities advertise. For example, Table 4.1 below shows the flagship areas of expertise that are advertised on the main research webpages of six of the surveyed universities. These universities advertise between three and 12 discrete focus areas of varying scope, in addition to acknowledging other research, for instance in emerging areas.

Table 4.1: Fields of research specialisation at six regional universities

University	Publicised research focus areas	
James Cook University	Tropical Ecosystems, Conservation and Climate Change Industries and Economies in the Tropics Peoples and Societies in the Tropics Tropical Health, Medicine and Biosecurity	
Charles Sturt University	Applied Philosophy and Public Ethics Land Water and Society Public and Contextual Theology	Agricultural Innovation Viticulture Prof. Practice, Learning and Education
University of Southern Queensland	Digital Literacy and Education Agriculture and Climate Science Applications	Regional Development
Charles Darwin University	Environment and Livelihoods Human Health and Wellbeing Indigenous Knowledges	Education at the Interface with Health Social and Public Policy Energy
Southern Cross University	Environmental Sciences Plant Sciences Geoscience Forestry Gambling Research	Marine Science Business Education Tourism
University of the Sunshine Coast	Healthy Activity, Sport and Exercise Technology for Social Issues Genetics of Ecology Inflammation and Healing Senior Living Eastern Grey Kangaroo Research	Health Improvement Forest Industries Koala Research Indigenous Studies Accident Research Regional Environmental Sustainability

Importantly, this table of research field specialisation at regional universities indicates how specialisation is region specific. For example, James Cook University in Townsville and Cairns focuses on tropical industries, health, ecosystems and societies; Charles Sturt University in the Murray/Riverina region has specialisations in land water and society, viticulture and agricultural innovation; and Charles Darwin University in the Northern Territory has specialisations in Indigenous knowledges, human health and wellbeing and public policy. Each of these specialisations serve the region specific industries that surround regional universities.

Collaborative gain

Where the field specialisations of individual universities fall short of answering particular industry challenges, regional universities are working together to present a broader capability profile to industry. For example, in the area of agriculture automation a number of regional universities are pooling their expertise to provide benefit across the necessary fields of expertise to address

this complex challenge. This is a sensible mechanism for creating critical mass that overcomes the typical academic siloes which make industry engagement difficult.

International Perspective: Collaboration for a national field-site network

The Ecuadorian Government is establishing IKIAM University in 2015, in the Amazon region. As a brand new university, IKIAM's greatest challenge (apart from geographic isolation) is to quickly accrue a critical mass of capability where none existed previously, and where there is limited financial capacity to grow new capability rapidly.

IKIAM is collaboratively using the capabilities of up to 20 organisations which have resources that can function as field-sites. Together, IKIAM's field-site network is unrivalled anywhere in the world, allowing researchers to study across 3.6 million hectares of diverse forest ecosystems from 0m to 4000m in the Amazon, on the Pacific Coast and in the Inter-Andean valley.

This is an outcome of collaborative gain associated with a regional university, that is now being marketed to the world's most prestigious universities.

Conclusion 4.1: Regional environments dictate that regional universities each specialise in distinctive research areas of strength, rather than attempt to maintain comprehensive research expertise.

Conclusion 4.2: This region specific specialisation of regional universities is linked to the industry of each region strengthening the ability of regional universities to contribute to regional innovation.

Conclusion 4.3: Where regional specialisation lacks the breadth to approach broad industry challenges, regional universities are collaborating to pool their capability across a broader range of specialties.

Further analysis of how regional university specialisation serves local industry is possible, however this would require a more detailed study that seeks responses from industry members in addition to universities. This is identified as an area of possible further work in Focus Area 14.

5. Focus Area 5 — Local industry participation

5.1 Background

While the focus of this report is on universities and what they do to engage with businesses for regional innovation, it is also important to assess the extent to which businesses see value in engaging with industry. While a full 360 degree review of all players in university-industry engagement is outside of the scope of this study, here are presented some early indicators of the extent of local industry participation in regional innovation with universities.

5.2 Findings

University views on local industry participation differ greatly

Statements from interviewees varied greatly in this Focus Area, and were highly qualitative. Many interviewees indicated that local industry is not innovative. The absence of local industry participants from industry forums hosted by universities or other mediators, appears to support this qualitative negative assessment of local industry's participation in innovation. However it may also reflect a possible industry viewpoint that universities are not prepared to engage on industry terms.

Other respondents provided more insight, saying that local industry is innovative but much of this activity is not undertaken with universities. Farmers and business owners that have to be the 'jacks of all trades' were used as an example. Where off-the-shelf products or service solutions are lacking in regional areas, business owners have to design their own solutions. This creates an ecosystem of self-focused innovators who are developing new solutions, not so much to build new markets, but simply to overcome their own business challenges.

This view was taken one step further by a non-university sector participant in this survey who stated that in their region, businesses do not look to universities for innovation because they view them as academic.

Conclusion 5.1: There is a disparity between regional university and industry perspectives on innovation, leading to a sub-optimal engagement between these sectors.

5.3 Analysis and Conclusions

The findings presented here represent university-centric snapshots of a broadly understood challenge in Australia. Stated crudely, companies may think universities are academic and universities may think companies are not innovative. However, these findings do not represent the many great examples of university-industry collaborations for innovation, such as the Strategic Management for Profitable Growth programme^{xxxix} in Victoria sponsored by the Department of Industry and Science and supported by Federation University.

With many notable exceptions, there is a significant divide between Australia's university and industry sectors. It is important to create ways to bridge this divide in order to improve Australia's low rate of university-industry engagement and our low rate for industry participation in R&D.

Discussion forums

There are a wide range of discussion forums aimed to stimulate engagement between industry and university sectors. In many cases these forums are poorly attended by industry. While discussion between universities and industry on key challenges is a positive step towards fruitful engagement, low industry participation at these forums is an indication that this discussion must be integrated with actions that industry values. Universities must move past the industry pitch, aiming to sell university services or technology catalysts, adding value to industry operations for the purpose of becoming an integral component within an ongoing process of industry driven product of service development.

Conclusion 5.2: Rather than using discussion forums as a primary focus for industry engagement, discussion needs to be embedded within functional activities that industry values.

The Author acknowledges that this survey of university stakeholders does not have the necessary feedback from industry to discuss the matter of industry participation fully. The author only attempts here to express the views of university stakeholders regarding local industry participation.

6. Focus Area 6 — Regional university workforce competency for industry engagement

6.1 Background

Strong innovation systems are built on the backbone of effective engagement between university and industry sectors. However, Australia has a poor level of engagement between these sectors and a strong aspiration to improve this metric. To do so Australian innovation must overcome a number of challenges. Industry often cites a lack of trust in universities, and reports an inability of universities to understand the needs of industry. It is therefore useful to ask how well equipped are university workforces to engage with industry and serve its commercial needs.

Is workforce competency in regional universities sufficient to foster strong sustainable university-industry engagement?

6.2 Findings

Strong industry competency at regional universities

Most universities reported that the industry competency of their researchers was strong, and that regional universities benefited from having researchers who live locally; are passionate about local needs and are focused on practical questions of relevance to the local region. They contrasted their industry readiness with other academic environments that are driven by academic excellence, diminishing their focus on industry needs. These perspectives are supported by funding data showing that regional universities are more successful at securing industry linked funding than excellence driven academic funding.

In addition to this broad view, there were also mixed reports of patchy competency, at individual researcher, and field specific levels. One university reported that competency differs between individuals and is not systemically driven, another stated that industry competency differs between fields and is lowest in fields that are driven by excellence.

Difficulty retaining talent

One university reported that some individuals maintained strong industry track records but overall securing and retaining research talent was a challenge. This university again cited the Australian Government university block funding formula and the resulting drive for academic excellence as a detractor from industry engagement.

Besides academic competency, universities reported a leakage of professional staff to metropolitan areas, reducing the support available to assist researchers to engage with industry at regional universities. However, all universities reported providing some form of professional support for industry engagement, in the form of staff training or administrative support.

6.3 Analysis and Conclusions

Researchers work within regions, for those regions

The findings of this study correlate with the findings of international studies, which have shown that university excellence inversely correlates with industry engagement. Many researchers in regional areas have grown up in those regions, understand and empathise with the needs of the region, and therefore have personal motivation to work with industry to resolve regional needs. More cynically, one might also conclude that researchers who do not have the track record to attract excellence-based funding from the ARC or NHMRC, are more financially motivated to turn to industry funding instead. Either way these motivations lead to regional universities hosting researchers that have relatively strong industry competency.

Conclusion 6.1: Having ties to their local regions and industries, researchers at regional universities typically have a good competency for industry engagement.

Conclusion 6.2: Regional universities are challenged by the need to retained industry competent professional staff, who are often lost to metropolitan workplaces.

7. Focus Area 7 — Using Teaching to drive regional innovation

7.1 Background

There has been broad discussion on whether regional university teaching leads to higher skilled regional workforces. There are many reports that indicate regional universities contribute to higher skilled regional populations. This is reportedly because people who are trained within a region are more likely to stay in that region. Anecdotally, it is also reported that regional universities have lower financial barriers to entry for local regional students, compared with relocating to a capital city. In addition to exploring this direct benefit of teaching within regional areas, this study investigated:

What role does regional university teaching may play as a gateway to stronger university-industry engagement and regional innovation?

International Perspective: First teach then innovate

Large U.S. companies involved in this study, including Michelin North America Inc., reported that their first engagement with universities is with their teaching programmes. This is hardly surprising since universities are teaching organisations. However this type of industry engagement does not occur on such a large scale in Australia. The benefit to universities from industry involvement in teaching programmes, is industry relevant coursework producing industry ready graduates. The benefit to industry is an improved supply of local industry ready job applicants. Most importantly it was reported that this teaching focused relationship can evolve into contract research and more advanced R&D programmes. This scale-up of university-industry engagement is demonstrated by the strong teaching, research and innovation relationships between Michelin in Greenville, South Carolina and its partner university, Clemson University.

7.2 Findings

Regional universities improve retention of regional school graduates

Interviewees agreed that provision of higher education within regional areas contributes to the retention of school graduates within that region. There was broad disagreement with the contrary view that restricting tertiary education to capital cities is a more efficient, lower cost way for regional school graduates to be receive higher education.

Industry linked teaching leads to industry innovation

One university reported a relationship with a large US based firm which began with teaching and is extending to a broader relationship focused on innovation.

Another university detailed how a major company located in an associated technology park was involved in their teaching programmes.

Another university illustrated that a lean management teaching programme, including a graduate diploma qualification, delivered to regional businesses had

not only directly improved the efficiency of those businesses, but had built local community respect for university education, potentially leading to a higher tertiary enrollment rate in the region in the future.

Furthermore the Cooma University Centre has been established by industry and other local regional end users to specifically deliver higher education that is responsive to the needs of industry in the region.

7.3 Analysis and Conclusions

Retaining school graduates and skilling workforces within regional areas

The literature that has analysed the importance of regional university teaching on retaining school graduates within regional areas, and presumably contributing to educating a skilled regional workforce, further presumably contributing to regional innovation is conflicted.

Some studies discredit claims that regional universities support regional innovation. These studies report that patenting or licensing rates between similar regions with or without regional universities are similar. However, use of this data is flawed given that there are many pathways that can lead to more innovative regional business, and these pathways are not governed by patenting or licensing activity. The lean manufacturing teaching programme reported above in the findings of this Focus Area provides one example.

These same studies also discredit claims that regional university teaching contributes to educating a skilled regional workforce. They report that similar regions with or without universities have populations with similar rates of higher education. They conclude from this data, that students are not permanently lost to cities if they are required to move to cities for higher education. However, use of this data is flawed since these studies have not traced the destinations of individuals, instead aggregating population data at the level of Statistical Districts. Conclusions based on these confounding factors do not make sense when compared with student destination data. For example, the Western Research Institute's study of graduate destinations showed that 70% of all graduates from Charles Sturt University got their first job outside a metropolitan area. For the University of Ballarat the figure was 84%. This strongly indicates that regional universities are exceptionally important for the skilling of regional workforces.

It stands to reason that if a society agrees that higher education is a desirable quality, as most societies do, then depriving regional areas of local higher education creates inequity. Even one of the studies referenced above acknowledges that social impacts of regional universities were not considered in their analysis.

The qualitative opinions of interviewees engaged in this study collectively supported the importance of regional universities in educating regional populations, and supported the need for higher education in a modern society.

Regional training as a pathway to regional innovation

Following the example of close university-industry engagement in the US, the Lean Management Programme of the University of Tasmania uses graduate training as a tool to seed industry engagement by building trust and respect with local industry in the North of Tasmania. This is a sensible response to Australia's current low level of university-industry engagement, recognising that respect must be built before sustained industry engagement can be entertained. It provides some proof that in Australia it is possible to create industry engagement for innovation, by first demonstrating value to industry through teaching.

Industry-driven university teaching

In Cooma, NSW, Snowy Hydro was finding it difficult to recruit employees with the skills they required. At that time Cooma was not serviced by a tertiary education provider. In response to this challenge, Snowy Hydro, with local government support established a "university center", based on the Geraldton Universities Centre model. The resulting Cooma University Centre provides degree programmes that are tailored to the needs of regional industry, namely Snowy Hydro. All course content for these programmes is drawn from many universities across Australia. This form of teaching delivery takes advantage of the freedom of online teaching, and the freedom of choosing course content from a variety of providers. But it also delivers necessary on ground face to face support for students, which typical online courses do not. Cooma University Centre represents an interesting form of industry-driven university education, one that has particular relevance for university-industry engagement, and for skilling regional populations.

Conclusion 7.1: Regional universities have an important role in skilling regional workforces.

Conclusion 7.2: Teaching at regional universities can also act as an icebreaker for further university-industry engagement for innovation.

Conclusion 7.3: University Centres are an interesting form of industry demand driven tertiary education, having relevance as a mechanism for university-industry engagement.

8. Focus Area 8 — Using CCR for regional innovation

8.1 Background

A simplistic view of university consulting and contract research (CCR) activity, is that research is undertaken by universities at the request of industry, for a service fee. Industry benefits from universities as innovation providers and universities benefit as recipients of service fees. Some universities can view the income stream from CCR as being the primary purpose of undertaking this activity. This simplistic view leads to policies that can lead to the pursuit of only the most immediately profitable activity. The soundness of these policies is supported by the fact that income from CCR activity in most Australian universities is important to subsidise the cost of largely unprofitable technology transfer activities.

However, viewed from a fundamental perspective, CCR activity is a critically important point of contact between university and industry sectors. Therefore this point of contact can be used in a variety of ways to stimulate university-industry engagement and build the capacity of universities to seed business innovation. Regional universities are doing this in a range of creative ways, and further examples of the use of CCR to build university-industry engagement are seen overseas.

International Perspective: Walking with industry before commercialising

There is a template view that technology transfer occurs when a university has intellectual property to sell and a company has a motivation to buy. However this view often does not reflect reality. Discussion with major U.S. firms such as Lockheed Martin and Siemens USA highlighted that many major companies prefer to develop technology with research partners through 'open innovation' research programmes rather than be passive agents that take up technology once developed. This mechanism implies that there must be a relationship between a university and a major company prior to a major technology transfer programme being undertaken. CCR presents a major opportunity to build university-industry relationships in advance of more significant engagement for innovation. This research positioning is exceptionally valuable, in addition to any cash income from CCR.

8.2 Findings

Incentives to support CCR

Most surveyed universities stated that they used a variety of measures to incentivise researchers to undertake CCR with industry. These incentives include, provision of insurance for CCR activity; industry engagement training; and a cash return to researchers for undertaking CCR. One university reported that this cash return to researchers had been withdrawn due to a harsh budgetary environment. One other university reported that cash return from CCR activity was managed at a Faculty/School level, with further disbursement to researchers only at the discretion of Heads of Faculty/School. There was

some acceptance that if researchers received no cash incentive for undertaking this work then this was in effect a disincentive for engaging with industry through CCR. There was great variance among universities regarding the degree to which CCR activity contributed to career promotion opportunities.

Excellence can be an inhibitor of CCR

One university reported that there was a hesitance to encourage researchers to undertake CCR activity because time dedicated to this activity would diminish focus on applications for Australian Competitive Grants. A second university indicated that incentives for undertaking this work were managed at a Faculty/School level and the degree to which researchers were encouraged to undertake CCR activity was dependent on the disposition of the Heads of those academic units.

In contrast to these views, one interviewed DVCR reported that the most important way for a university to incentivise researchers to undertake CCR activity, is for the university executive to be loudly expressive about the importance of CCR for research positioning in addition to any cash flow. This interviewee also commented that universities had to be flexible in their management of CCR to support this research positioning priority. From that university it was reported that CCR was undertaken for research positioning in addition to cash income, to broadly build trust and further engagement with industry. In doing so, this meant that on occasions cash return for CCR activity was viewed as being of secondary importance to building strong sustainable industry relationships.

Minimal CCR 'grey trade'

A number of interviewed university managers held the view that there was only a limited 'grey trade' in CCR activity, meaning that there was not a significant number of researchers circumventing university systems to work independently with companies. One university reported that it was their flexible approach to managing CCR that limited the number of researchers that might otherwise be motivated towards grey trade CCR.

International Perspective: Agricultural extension services in the US

U.S. land grant universities are an ideal example of how activity that would be called CCR in Australia is used to develop sustained systemic industry-university engagement for regional innovation. Land grant universities, many of which are located in agricultural regions of the U.S., were originally funded specifically to support practical training in agriculture and other fields of economic importance. In practice, this means that those land grant universities undertake activity that in Australia would be called agricultural extension work. The outcome of this U.S. system is that not only do agricultural services get delivered, the delivery of those services by universities seeds trust and respect with regional businesses, which creates a foundation for further university-industry engagement for regional innovation.

Notably, many regional land grant universities such as University of Georgia, are also World top 200 universities, demonstrating that the delivery of agricultural services to regional industry has not distracted these universities from academic achievement.

8.3 Analysis and Conclusions

Flexible CCR Policies

More flexible university policies are necessary if we are to emerge from the limited understanding that the primary benefit of CCR is cash income. CCR has the potential to act as a key point of knowledge exchange between universities and industry and this knowledge exchange has value for both parties over and above immediate cash flow.

Some of the universities surveyed, prioritize the value of knowledge exchange in addition to cash income from CCR. For example, The University of Southern Queensland has stated that research positioning is valued as a key outcome of CCR. This philosophy is viewed as being a contributor to the strong engagement USQ now has with local regional farmers and associated organisations. It is also seen as a contributor to their strategic relationship with John Deere. By lowering the cash threshold for initial engagement, universities can widen the pathway to sustained long term engagement with industry.

Researcher incentives to undertake CCR

It stands to reason that researchers must be rewarded to undertake CCR activity. Incentives that exist among surveyed universities include:

- Cash returns to researchers;
- Teaching buy-out;
- Promotion incentives;
- Administrative support;
- Industry engagement training;
- Knowing that your research is creating a positive impact.

A key barrier to providing budget sensitive incentives is the Australian Government's university funding formula. Universities are not significantly financially incentivised to undertake CCR activity therefore it is financially challenging for universities to financially incentivise researchers, or provide other cost sensitive incentives.

Agriculture extension services

Even though it is widely undertaken in the U.S., there are only isolated examples in Australia of government departments outsourcing agriculture extension activity to universities. In these instances, there is no national consistency regarding how universities are funding, skilling or undertaking these activities. In the U.S., clear benefit can be seen stemming from this activity, in the form of strong university-industry engagement in the agriculture sector. For similar benefit to be realised in Australia, care must be taken to ensure that if universities undertake this activity, that they have or can acquire the appropriate expertise to do so, and are funded appropriately to employ this expertise.

Business Innovation Services

Business innovation services are another area of significant government activity that could in principle be considered for delivery by universities. There are examples of business innovation services being delivered by regional universities, some through associated business innovation parks. The association of this form of service delivery with innovation providers such as universities, creates a direct link between universities as innovation providers, and businesses as innovation buyers, creating opportunities for this entry level activity to grow into more significant regional innovation work. For this premise to work in practice, there must be a baseline of trust and respect between universities and industry. It is doubtful that this baseline exists in all regions and any development plan to implement this idea would need to scale up activity with care to build mutual respect slowly.

Conclusion 8.1: University research positioning with industry for future engagement is an important outcome of consulting and contract research activity, over and above immediate cash income.

Conclusion 8.2: It is a challenge for universities to provide researchers with cash incentives to undertake consulting and contract research because universities themselves receive little cash incentives to undertake this work.

Conclusion 8.3: Many regional universities are committed to using consulting and contract research for research positioning.

Conclusion 8.4: The delivery of service activities such as agricultural extension services and business advisory services, could be a useful tool to seed university/industry engagement in Australia, as it does overseas.

9. Focus Area 9 — Using technology transfer for regional innovation

9.1 Background

Technology transfer is an essential mechanism to commercialise intellectual capital from Australia's regional universities. For the purpose of this report, technology transfer is viewed as a process that commercialises intellectual capital in a linear transfer from research providers, to innovation developers, and ultimately to buyers of technology.

Despite its importance, technology transfer has well understood general constraints. These constraints include high cost, long development timeframes, high risk for initial investment, difficulty of accessing capital markets and low likelihood for blockbuster outcomes. These general constraints are compounded by additional challenges that are specific to Australia's regions. While a global blockbuster derived from regional intellectual capital may be a commercial success and return profit to the regional company involved, there may be little broad benefit to other regional businesses. This is where traditional technology transfer approaches contrast with more localised business innovation activities that are discussed in Focus Area 11 of this report.

Is technology transfer working well for regional universities, and where they are successful, is this success translating into increased regional prosperity?

9.2 Findings

IP Management processes

All surveyed universities had processes for identifying and protecting intellectual property and all universities viewed this activity as being an important factor for translating the outcomes of research into community impact. However, surveyed universities reported a low level of technology transfer activity. These qualitative reports are supported by national data on university income from licensing activity^{xi}. No university reported that their technology transfer activity was sufficient to justify the full time employment of a staff member. These individual responses are reinforced by the limited number of staff dedicated to the management of technology transfer at any of the surveyed regional universities. It is typical for a regional university to employ one or two commercialisation staff who are primarily dedicated to managing consulting activity and only secondarily occupied by activity related to technology transfer.

One university specifically commented that much of the activity undertaken by their commercialisation office relates to collaborative industry engagement for business innovation, rather than technology transfer. Another university stated that they were lucky to attract to their region the one commercialisation manager that they had, and if that person left, they would struggle to attract people with the necessary skills for technology transfer. Another university stated that they would value external assistance to manage a more robust IP identification and protection process, including external assistance to train researchers on the importance of technology transfer, and more broadly research translation. A

One of the greatest challenges that must be overcome to achieve this, is the existing location of Australia's intellectual property, distributed across the many small siloed portfolios of individual universities. This challenge exists for all Australian universities and other Australian innovation providers, not just regional universities.

The distributed nature of intellectual property in Australia exacerbates technology transfer challenges such as:

- The cost of protecting and developing each small silo of IP;
- The visibility to venture capital markets of many small siloes of IP;
- Distributing the expertise necessary to connect innovation providers with other players necessary for technology transfer.

One response to the challenges created by having many distributed small siloes of intellectual property, is to establish an agency that is capable of aggregating Australia's IP and connecting with international venture capital markets, innovation developers and innovation buyers.

There was much discussion regarding the structure and function of an agency such as this, and how a rigorous development plan might be pursued. Key discussion points included:

- While innovation providers such as regional universities are in need of a central agency, so are many other small innovation providers. These organisations include providers that have a defined term such as CRCs and Industry Growth Centres; providers that have a defined focus such as RDCs; and academic collaborations such as ARC CoEs.
- Preliminary commercialisation processes, including IP identification and IP protection are best undertaken by individual universities due to the need for a detailed organisational knowledge within each university. However, a central agency may play a role in training universities to undertake these functions effectively. Also a central 'hub' agency with 'spokes' reaching into client universities might have sufficient organisational knowledge to be able to undertake these formative IP management processes.
- The primary role for a central agency lies beyond the roles of innovation providers, as an interface between innovation providers, innovation developers (eg start ups), and innovation buyers (eg. large companies).
- Until 2013, UniQuest undertook the role of a central commercialisation agency for up to eight external organisations, including metropolitan and regional universities, a medical research institute and ARC CoEs. The rapid growth of this business model indicates the appetite that exists in the Australian research sector for a central commercialisation agency. The unexpected withdrawal of these services in 2013 also highlights the need to structure any central agency sustainably. It is understandable that it may not be sustainable for one university to undertake commercialisation on behalf of its other university sector 'competitors'. This in no way invalidates the soundness of proposing a central agency for technology transfer.
- Such an agency exists in Scotland. Scottish Enterprise is a government owned agency that offers a wide range of commercialisation services to

Scottish innovation providers including technology licensing, new product development, export business development, entrepreneurship, industry collaboration and training^{xliii}. Anecdotally, Scottish Enterprise is seen to be a successful organization that has the flexibility to work with industry and the stability to work across many innovation providers, developers and buyers.

- There was universal agreement among interviewees that any proposed agency would have to have the centrality and impartiality to serve any innovation provider, but must also have sufficient flexibility to work directly and effectively with industry. It was perceived by many that government departments typically lack this flexibility. However Scottish Enterprise has proven that a government owned enterprise may have sufficient flexibility to achieve success.

Conclusion 9.1: Technology transfer at regional universities is a marginal activity, challenged by small IP portfolios and the innate high risk and cost of technology transfer.

Conclusion 9.2: A central agency for technology transfer is universally viewed as a sensible possible solution to the challenge of technology transfer across a wide range of innovation providers.

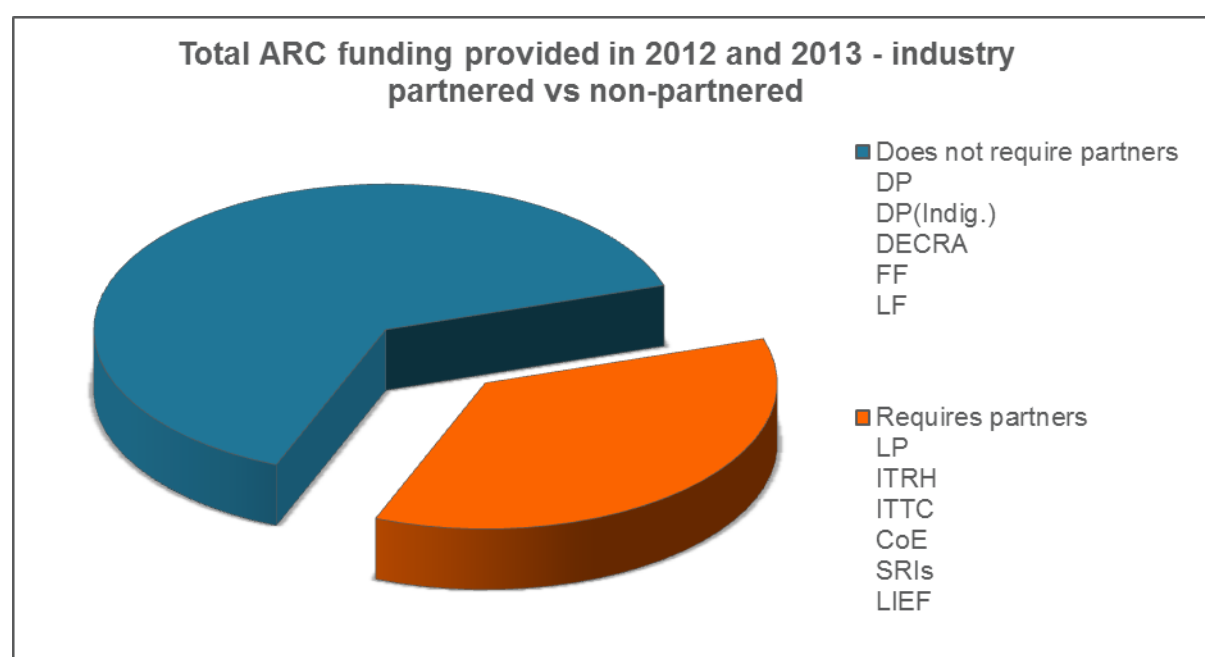
Conclusion 9.3: Any proposed agency needs the impartiality to work across many innovation providers, and the flexibility to work with industry.

10. Focus Area 10 — Using industry sponsored grants for regional innovation

10.1 Background

The proportion of major grant funding that requires cash and in-kind contributions from industry has increased over years, and now makes up a considerable proportion of total funding available. This holds true even for granting agencies that traditionally have an academic focus.

Figure 10.1: A significant proportion of ARC grant funding requires industry contributions.



It has been argued that this can disadvantage regional universities because of their dislocation from metropolitan headquartered large companies, and the difficulty that smaller, more regional, companies have in contributing large amounts of cash to these significant schemes. However, 2013 HERDC data shows that regional universities perform better in industry linked schemes than academic schemes, as shown in Figure 2.1 of this report.

Since regional universities appear well positioned to win industry linked funding, and are well positioned to drive regional innovation, and since industry involvement in R&D is a desirable outcome, is it valuable to ask:

Which industry-linked grant schemes are considered to be particularly effective for driving regional innovation.

10.2 Findings

ARC and NHMRC entry barriers are high

A number of interviewees reported that funding from ARC and NHMRC industry-linked grant schemes does not constitute a significant income stream for many regional universities. The nature and scale of industry engagement is important for applications directed at these schemes. However the additional need for applicants to have exceptionally strong academic publishing and grant winning track records, means that these schemes have an exceptionally high threshold for entry. This threshold is too high for many researchers at regional universities.

RDC and other industry linked funding is important

Interviewees reported that industry-linked funding from sources such as Rural Research and Development Corporations (RDCs) constitutes a much more important income stream for many regional universities. This perspective is supported by HERDC data provided by universities to the Australian Government regarding their research income streams.

Business innovation and engagement activities are difficult to fund

Some interviewees noted that many schemes have a strong focus on technology development, rather than business innovations that do not involve new technology. This is seen by some to be a flaw in relation to regional business innovation since the development of innovative services or business processes has the potential to greatly improve regional business innovation within a short timeframe and with relatively low risk.

It was noted by many respondents that there is very little funding available which has the primary purpose of seeding university-industry engagement. This perspective is handled in the next Focus Area of this report and it is acknowledged that university-industry engagement is undertaken as an element within funding schemes that have a broader purpose.

10.3 Analysis and Conclusions

Funding to support sustainable university-industry engagement

Australia is challenged by a low industry participation rate in R&D. Australia also has low engagement between university and industry sectors when compared internationally. However minimal funding is available to support activities that are specifically aimed to create sustained engagement between universities and companies. Funding is available for specific projects that are undertaken through universities collaborating with industry however, these transactional engagements often only last for as long as the funded project.

Non-transactional activities that occur outside of a specific research project are much more difficult to fund and yet these activities, such as cluster based industry engagement have been shown internationally to create the antecedents for sustained university-industry engagement.

The Collaborative Research Network (CRN) Scheme

A single round of the CRN Scheme was held in 2010 by the then Department of Industry, Innovation, Science and Research. Its aim was to build the capacity of regional universities by partnering them with stronger metropolitan universities. Increased research excellence was a driving motivation behind this scheme, which as previously discussed, can impact negatively on industry impact.

A review of this previous scheme has never been published, to the best knowledge of the author of this report. However anecdotally, an unexpected benefit of the scheme was regional university-industry partnerships that have reportedly produced some exceptional industry outcomes.

In a ministerial press release at that time, “flexibility” was claimed to be one of the scheme’s “best features” and projects did not need to be “limited to specific research fields”. In response, many regional university applicants placed an emphasis on engagement with industry in their proposals.

Most interviewees viewed the old CRN scheme as an important scheme for building regional business innovation. Suggestions for improving any future similar scheme included making industry engagement mandatory; increasing the term of CRN proposals to at least 5 years; and increasing the total amount of funds held within the scheme. A detailed review of the impacts of the old CRN scheme would be a very useful starting point for composing any future funding schemes that are aimed to support regional business innovation.

The Australia-China Strategic Research Fund – Group Missions

As noted previously in this report, this scheme was one of a very few sources of funding for international capacity building activity. This scheme was very successful in supporting regional innovation providers. Future schemes with a broader international focus, and a requirement for industry engagement would fill an important funding gap required for the development of sustainable university-industry partnerships.

The Cooperative Research Centres (CRC) Programme:

The CRC Programme of the Department of Industry, Innovation and Science was noted by all interviewees as being very important for regional innovation, and very successful in joining regional universities with regional businesses. More detailed discussion is beyond the scope of this report. Detailed analysis is required to determine the exact nature of partnerships that CRCs have brokered between universities and regional businesses, particularly SMEs. A recent review of the CRC programme was released in May 2015^{xliii}. Recent success stories for university-industry engagement for regional innovation include:

- SmartCap^{xliv}: Four universities and 13 companies have contributed to the development of SmartCap, baseball cap that monitors brainwaves, providing immediate biofeedback to manage driver fatigue. Rio Tinto, Anglo American and a range of other mining companies are currently implementing the technology with heavy machinery operators.
- Pregnancy scanning data for better sheep flock management: Two universities and other CRC industry participants, in conjunction with 40

SME pregnancy scanning businesses are helping farmers better manage their flock, including making sure ewes receive targeted nutrition for their pregnancy status and body condition for a good lambing outcome.

- EverGraze: Four universities and industry partners including the three major Australian agricultural R&D investors, have developed farming systems for sheep and cattle grazers in high rainfall regions, which can boost profits by up to 50 per cent while improving water management, perennial use, soil health and biodiversity.

Conclusion 10.1: The industry-linked funding schemes of Australia's two major academic granting bodies (ARC and NHMRC) are not effective for engagement between regional universities and regional businesses.

Conclusion 10.2: It is important to find ways to support the antecedents of sustained university-industry engagement, outside of the confines of specific research programmes.

Conclusion 10.3: The CRC Programme, Entrepreneur's Programme, and the previous Researchers in Business, CRN and ACSRF Group Missions schemes have successfully supported the building of sustained university-industry partnerships.

11. Focus Area 11 — Using cluster engagement for regional business innovation

11.1 Background

Innovation has been interpreted in many ways. International commercialisation of technology through technology transfer pathways is one mechanism that underpins innovation. However this mechanism can have a 20 year timeline for maturity (e.g. drug discovery), and has an inherently high risk of failure. If successful, international market uptake of new technology can yield high returns for stakeholders. However to regional or small business communities, benefit can be indirect and limited. Other mechanisms for business innovation within Australia's regions, can have much greater impact on regional and small business communities, having a shorter term to maturity, lower risk, and greater local impact.

Since regional businesses are often minor beneficiaries of university technology transfer, and other business innovation mechanisms are often overlooked, it is sensible to ask:

What sort of R&D activities lead to regional business innovation, and how are regional universities undertaking these activities?

11.2 Findings

Cluster industry engagement is effective

There was consistent agreement among surveyed universities that industry cluster activity is beneficial for building more innovative regional businesses. Interviewees referred to this activity in various ways, as 'peer networks', 'industry clusters' or 'engagement initiatives'. On principle these equivalent activities are defined by:

- A cluster of related industry and other stakeholders;
- A defined challenge that cannot be resolved by individual members in isolation.
- A clear purpose that can be achieved within a medium time-frame through the collective activity of the cluster partners.

A wide body of international research exists to better understand how clusters work and what underpins their success^{xlv,xlvi}. Also a Global Cluster Observatory^{xlvii}, and an Australian Cluster Observatory exist, to educate businesses about the practical benefits of clusters. Furthermore a large number of 'clusters' or 'peer networks' with varying size, purpose and structure have been developed in association with regional universities over a number of years.

However, there is no consistency in purpose, structure or activity among these examples of industry clusters in Australia. The lack of visible universal organising principles among these examples indicates that current activities are not benefiting from the wide body of international research that has identified success traits for productive industry clusters.

11.3 Analysis and Conclusions

Government seeded industry clusters

The Cairns-based Super Yacht Group is a \$30M per annum cluster of approximately 40 companies and is a successful outcome of a prior industry cluster that was sponsored by government. The Group is a valuable template for understanding how a cluster of businesses can make upstream supply chain or downstream value chain improvements to access new international markets. Many other similar examples of government-stimulated industry clusters exist in Australia and overseas including:

- Supply chain mapping work that has been undertaken by Enterprise Connect in conjunction with the University of Tasmania with businesses and SMEs in the Cradle Coast region of Tasmania.
- SME Capacity Building work that has been hosted by the Department of Industry and Science and supported by Federation University in Ballarat.

International Perspective: An industry cluster in Ecuador

Even in very isolated regions with microbusinesses that have exceptionally low financial capacity, industry clusters have found success. In the small town of Cuenca in Ecuador, artisanal leather workers were making products for the local tourist trade but were failing to connect with larger markets through export. Individually these microbusinesses lacked the scale, the range of value added products, and the business acumen that is necessary to trade internationally. A government stimulated cluster approach to building the export capacity of these artisanal leather workers in Cuenca, has created access to new international markets and increased local economic activity.

Industry Growth Centres Initiative

The Department of Industry, Innovation and Science is implementing the Industry Growth Centres Initiative as a tool to drive nation-building activities at a whole of industry level. An analysis of the value of this Initiative for that purpose lies beyond the scope of regional innovation and beyond the specific scope of this study. However, it has been noted that the “nation-building” and “whole of industry” vision of the Industry Growth Centres Initiative is quite distinct from the purpose of industry clusters. Because of their scale and irrespective of their value, the Industry Growth Centres Initiative should not be seen as a response to the need for geographically and sectorial focused industry clusters, such as those being discussed here.

University seeded industry clusters

There was almost universal agreement among university interviewees that engaging with industry stakeholders around key challenges is a critical first mechanism that leads to future sustained university-industry cross-sectoral engagement. These vanguards of engagement seed the cross-sectoral trust, respect and understanding that is necessary for sustained engagement - engagement that is fundamentally lacking in Australia.

Despite the importance of engaging with industry stakeholders around key challenges, there are no dedicated external sources of funding that are focused to support this activity. It is acknowledged that other forms of funding can be used to undertake cluster based activity within a broader purpose. University respondents stated that existing activities are funded internally by cluster participants and by the universities themselves. While self-funding of this activity provides one appropriate means of support, this leaves much room for further stimulation of this important activity through external support.

Conclusion 11.1: University seeded industry cluster engagement is a gateway to future sustained university-industry cross-sectoral engagement.

Conclusion 11.2: The lack of broad based activity in this area, and the lack of funding for this activity in Australia perhaps contributes to Australia's limited university-industry engagement for business innovation.

12. Focus Area 12 — Student and staff entrepreneurship

12.1 Background

One critical pathway that regional universities use to drive regional innovation, is through entrepreneurship programmes for undergraduate and postgraduate students, and for university staff. This Focus Area asks:

How do regional universities foster entrepreneurship, and are specialised strategies required for entrepreneurship training in regional areas?

12.2 Findings

Approaches to entrepreneurship training lack consistency

Responses from surveyed regional universities differed markedly in this Focus Area. Some universities attributed a very low priority to entrepreneurial training. Other universities prioritised this area highly and undertook a variety of activities. However there was little with consistency between the approaches of different universities undertaking activities in this area.

There appeared to be minimal consensus among regional universities about the importance of entrepreneurship training or how to develop entrepreneurship among students or staff. At least one surveyed university specifically stated that they had no dedicated strategies for student entrepreneurship development. Instead they inferred that their existence as a university naturally conferred an entrepreneurial attitude to their students. In contrast, at least one other surveyed university had purposefully included entrepreneurship training into their undergraduate business degree programme, specifically with the intent of increasing the local workforce capacity for entrepreneurship and innovation.

12.3 Analysis and Conclusions

Specific undergraduate courses with entrepreneurship content

There is only one dedicated strategy for student entrepreneurship explicitly revealed by this study's survey. This is the inclusion of entrepreneurship training into undergraduate business degree programmes, specifically with the intent of increasing the local workforce capacity for entrepreneurship and innovation. This contrasts quite markedly with a wide range of entrepreneurship activities that are undertaken overseas, at elite universities, but also in developing regions such as Ecuador.

International Perspective: IKIAM University and Young Potential Development

IKIAM University in Ecuador is being established, in part, to seed innovation and entrepreneurship in the Amazon region, which is an isolated and poor socio-economic region in Ecuador. This activity is one part of a national drive to build a knowledge economy build on innovation.

As a first step, IKIAM is delivering a social development programme through its international delivery partner Young Potential Development. IKIAM views that basic assistance to help students understand who they are and what they want to achieve as professionals, is essential in a university dominated by “first in family” university students, also in a region where there is little cultivation in families of the value of higher education and entrepreneurship.

Some parts of regional Australia could also be characterised as having higher proportions of “first in family” undergraduate students, from lower socio-economic backgrounds, from families that have no previous recognition of the value of higher education. IKIAM has tailored its entrepreneurship programme in response to its environment, region specific entrepreneurship training may be just as important for a regional Australian context.

Staff industry fluency programmes:

There is only one dedicated strategy for staff entrepreneurship development explicitly revealed by this study’s survey. That is the provision of staff training for industry engagement. The specific intent for this training is to increase staff fluency for industry engagement to support positive and productive relationships with industry.

It is acknowledged that ‘entrepreneurship’ can be interpreted in many ways and can be delivered by many different areas within universities, this means that the full suite of strategies used for student and staff entrepreneurship may not have been captured by this study.

Social entrepreneurship programmes

In the U.S., Brown University draws great pride from its focus as a socially engaged university. It is also consistently ranked as a top 10 university for undergraduate teaching in the U.S.. Brown’s Social Innovation Initiative is a whole of university focal point for developing social entrepreneurship within its student community. As a corollary, the activities of this initiative contribute greatly to the University’s engagement with its local community. The Initiative is a tool to build trust and respect with the local community as a necessary platform for effective future engagement.

Business plan competitions

While no surveyed regional universities specifically reported on any business plan competitions that they participate in, such competitions are being held, and they are effective ways to encourage student entrepreneurship training across many universities.

For example, The Pharmacy Guild of Australia hosts an industry sponsored national business plan competition for pharmacy students^{xlvi}. In 2014, 18 Australian universities participated, demonstrating that the competition has great reach to seed entrepreneurship training across many universities at once. Incidentally, a regional university, Charles Sturt University was home to the winning student team (in partnership with University of Canberra). Their winning bid focused on better delivery of regional community pharmacy services, including tele-health.

Lack of strategic organisational planning and coordination

The sparse and inconsistent responses that this study received from surveyed universities on this Focus Area does not necessarily mean that student or staff entrepreneurship is not being fostered. This may be occurring as a part of industry placement programmes, high performing student programmes or through other mechanisms. A study of these activities would need a much broader scale of engagement within each university to draw rigorous conclusions about what is occurring. However, the work undertaken here illustrates that entrepreneurship may not be treated by universities as a core graduate attribute. Also that entrepreneurship training may not have a high enough visibility at a senior management level, for the university sector to consistently adopt mechanisms that have proven successful for fostering entrepreneurship.

Conclusion 12.1: National business plan competitions are a low cost and effective mechanism to focus and stimulate entrepreneurship training across many universities.

Conclusion 12.2: It is beneficial to deliver entrepreneurship training in a region specific context, this is a particularly important factor for consideration by Australian regional universities serving diverse student populations.

Conclusion 12.3: There is little existing consistency among regional universities for the delivery of entrepreneurship training to students or staff.

13. Focus Area 13 — Streamlined university structures for regional innovation

13.1 Background

The ability of universities to drive innovation is dependent on effective engagement with companies and other external organisations. However, university structures typically have divisions between their teaching, research and service activities, making whole of organisation functions like engagement quite challenging. Effective engagement is a challenge for universities because of industry's need for a streamlined interface, or at least the need for university strategies to overcome structural barriers to whole of organisation engagement with industry.

13.2 Findings

Effective university structure overseas

Examination of 16 World top 100 universities in the Northeast USA has revealed that although university structures differ remarkably, five principles for streamlined engagement with industry are followed by particularly well-engaged universities. These principles are:

- Having a senior academic leader who is primarily dedicated to engagement;
- Having a dedicated team, centre or unit for engagement;
- Placement of that team so that it can act across organisationorganisational boundaries;
- Adequate staffing within that team to maintain a deep knowledge of organisationorganisational capabilities;
- Strong collaboration internally with other supporting units (offices for research, commercialisation, or legal services).

International Perspective: MIT's Industrial Liaison Program (ILP)

The ILP at MIT is an international gold standard for operating a streamlined interface with industry. Global companies connect with ILP to engage with researchers across MIT, irrespective of the possible nature of that engagement (consultancy, contract research, industry sponsored grants, corporate social responsibility etc). Companies pay a substantial fee to talk to ILP, this membership fee supports a budget to incentivise MIT researchers to join the engagement table.

Of course only MIT has the industry pulling power to be able to attract such a membership fee from companies. Having a historical association with 81 Nobel Laureates is an advantage. However, the concept of creating an organisation-wide one stop shop for industry engagement is a good one, that is being taken up by other less wealthy and less prestigious U.S. institutions such as the University of South Carolina.

Australian university structures

Three of the eight Australian regional universities surveyed had a senior academic leader who was primarily responsible for the engagement function of the university, and a dedicated team or centre to undertake engagement work. This is remarkable among Australian universities, where engagement is often led and undertaken in a distributed fashion across multiple intra-organisational jurisdictions, lacking whole-of-organisation coherence.

13.3 Analysis and Conclusions

Senior leadership for engagement

Although the organisational structures of all surveyed regional Australian universities reflected traditional Australian university structures, three of the surveyed universities placed a strategic emphasis on engagement by identifying a senior academic leader who is primarily dedicated to whole of organisation engagement.

Conclusion 13.1: Having a senior executive leader who is responsible for engagement is an essential component of a streamlined structure for engagement with industry. It is an indicator that a university has seriously considered how it should drive innovation and it might be one predictor for future success in driving regional business innovation to create direct line of sight between a university's engagement function and its executive management. It is also a powerful statement to all university staff, demonstrating the importance of engagement to the organisation.

A coordinating centre for engagement

While all surveyed universities undertook engagement activities, three universities had formed dedicated central administration or academic faculty units to coordinate their university's engagement function. These units not only supported the implementation of organisation-wide engagement activities, but they also acted as beacons for communication with other faculty or school based engagement activities.

Conclusion 13.2: Having a single coordinating centre or unit to oversee whole of university engagement is an effective response to the need for industry to see a single coordinated point of entry into a university.

14. Focus Area 14 — Future activities

Addressing 13 focus areas has meant that this study has opened lines of investigation across a wide range of critical challenges for regional innovation. However, this broad scope and completion within a short time period, has meant that detailed quantitative data collection and evaluation, and detailed formulation of solutions to each challenge is beyond the scope of this work. This Focus Area identifies critical, interesting, and relevant areas of further investigation. Further work in these areas may be considered by the Department as being of interest.

A) Assessing the value of cluster-based industry engagement programmes

This study has highlighted cluster-based industry engagement as:

- A valuable way to drive regional innovation.
- An activity that is under-utilised in Australia.
- An activity that would benefit from greater attention.

For these reasons further work could:

- Analyse how cluster-based industry engagement might work best in an Australian context.
- Analyse what forms of support might best drive these activities.
- Draft a development plan to build this activity in Australia.

B) Exploring the concept of a national commercialisation entity

This study has highlighted that a national commercialisation entity:

- Could resolve many challenges that are currently faced by many Australian innovation providers, not limited to regional universities.
- May receive strong buy in from many stakeholders.
- Needs careful development to ensure impartiality, flexibility and financial sustainability.

Further work in this area could:

- Build a case for the establishment of a national entity.
- Identify the industry needs that such an entity should address.
- Identify the nature and characteristics of a national entity.
- Propose a development plan to establish a national entity.

C) Broadening the scope of this existing study

The author acknowledges that this study is limited by its focus on the university sector and its inclusion of 8 universities. While the author maintains that the conclusions drawn in this study are rigorously supported by the data collected, it is acknowledged that:

- Inclusion of more universities would deepen possible analysis of university activities.
- Inclusion of Australian industry and government interviewees would provide necessary counterpoints to university sector perspectives.

D) Assessing of the value of industry focused international missions

Australia has almost no available funding to support university-industry international missions. While there are strong arguments for this activity to be funded by industry, there is also value in exploring how successful are schemes such as the Australia-China Science and Research Fund – Group Missions scheme.

E) Assessing the value of the Collaborative Research Network scheme

Despite not being designed for this purpose, the Collaborative Research Network scheme has been, anecdotally, praised for its success in driving regional university-industry engagement. Further analysis is needed to establish:

- Whether regional university-industry engagement is a priority.
- What elements of the CRN scheme supported this activity.
- What additional elements could be factored into possible future improved schemes.

F) Analysing how entrepreneurship is, or should be, fostered through tertiary education

This study has shown that entrepreneurship training is being undertaken in an *ad hoc* fashion, or is not being purposefully undertaken at all. Further analysis is needed to establish:

- The value of entrepreneurship training.
- What tertiary education activities best foster entrepreneurship.
- A set of activities across that could be implemented across tertiary education organisations that can consistently drive entrepreneurship in university graduates.

G) A review of the effectiveness of industry sponsored university centres

This study has identified that Australia now has two 'University Centres' supported by industry and local government specifically to provide tertiary training in areas of relevance to local industry, where none existed previously. These Centres implement a unique and innovative teaching model that is cost effective and tailored to industry. Further analysis is required to:

- Understand the value of these novel training initiatives.
- Understand how this model might be used in other regional areas.

H) A review of the value of peri-capital city business and technology parks

This study has identified that peri-capital city business and technology parks have unique characteristics that differentiate them from metropolitan parks. Further analysis is required to understand:

- Their unique role in driving innovation particularly for micro and small to medium sized enterprises.

Appendix 1 — Participants table

<i>Organisation</i>	<i>Interviewee</i>	<i>Position</i>
Australian Regional Universities		
University of Southern Queensland	Mark Harvey	Deputy Vice Chancellor Research
University of Southern Queensland	Erin Rayment	Director, Research Development
Charles Sturt University	Sue Thomas	Deputy Vice Chancellor Research
Federation University Australia	Frank Stagnitti	Deputy Vice Chancellor Research
Federation University Australia	Lynne Reeder	Business Development Consultant
Federation University Australia	Cameron Beyer	Manager, Commercial Services
Sunshine Coast University	Roland de Marco	Deputy Vice Chancellor Research
Sunshine Coast University	Mark Paddenburg	Chief Executive Officer
James Cook University	Jasper Taylor	Director Commercial Services
Charles Darwin University	Brendon Douglas	Director of Research
University of Tasmania	Janelle Allison	Pro Vice Chancellor, Community, Partnerships and Regional Development
Southern Cross University	Geraldine Mackenzie	Deputy Vice Chancellor Research
Australian Other Organisations		
Regional Universities Network	Caroline Perkins	Executive Director
CRC Association	Tony Peacock	Chief Executive Officer
Innovative Research Universities	Connor King	Executive Director
Kerrin Anderson Consultant Lawyer	Kerrin Anderson	Principal
Dept of Industry and Science	Mark Amirtharajah	Business Advisor
Regional Development Australia	Tracy Scott Rimmington	SEQ & Regional Development Coordinator
Dept of Industry and Science	Sarah Jones	Innovative Regions Facilitator
International Energy Centre	Tim McLennan	Chief Executive Officer
Cooma Universities Centre	Zoe Dawson	Cooma Universities Centre Manager

International Universities

MIT
Princeton University
Yale University
Columbia University
New York University
University of Maryland
George Washington University
Georgetown University
Clemson University
University of South Carolina
Brown University
University of Western Cape
Tufts University
Boston College
IKIAM Universidad Regional Amazónica

International Industry

Siemens
Intel
Sanofi
Roche
Michelin
DuPont
Bayer Material Science
Lockheed Martin
Elsevier
Tufts University
Boston College

International Other Organisations

Ford Foundation
New York Academy of Sciences
The Foundation Centre
SBIR/STTR Program
Council for Chemical Research
University Industry Demonstration Partnership
US National Academy of Sciences
SBIRSource
National Nanotechnology Coordination Office
Mosow Innovation Development Centre
Cluster Zelenograd
AutoHarvest Foundation
US Department of Transport

International Universities

Facultad Latinoamericana de Ciencias Sociales Sede Ecuador

Ford Foundation

New York Academy of Sciences

The Foundation Centre

SBIR/STTR Program

Council for Chemical Research

University Industry Demonstration Partnership

US National Academy of Sciences

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