

# Macro-level Evaluation 2 of Advance Queensland | Final Report

Department of Tourism, Innovation and Sport

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# REPORT ON A PAGE

## MACRO-LEVEL EVALUATION 2 OF ADVANCE QUEENSLAND

### ADVANCE QUEENSLAND

Advance Queensland (AQ) is a cumulative \$755 million flagship initiative over the course of 2015-16 to present, consisting of approximately 140 different programs and activities delivered by nine government departments, aiming to fulfil a vision of “A state made for innovation – where ideas matter, collaboration takes us further, faster, and local innovation spurs productivity, creates jobs and builds our quality of life”.

### EVALUATION

- ▶ This macro-level 2 evaluation assesses Advance Queensland from its inception to March 2021.
- ▶ The evaluation has an emphasis on three key evaluation domains: reach, effectiveness, and efficiency. It focusses on the overall impact of the AQ initiative and highlights selected activities or programs to assist in the illustration of key findings. It follows an earlier macro-level 1 evaluation focused on implementation completed in September 2019.
- ▶ This second evaluation was delivered over three stages from July 2021 to January 2022.

### EVALUATION REPORT

- ▶ Findings and opportunities have been developed based on literature review, analysis of various datasets – program data, publicly available and restricted data, survey results – and stakeholder engagement through interviews and focus groups.
- ▶ AQ’s funding has not been fully expended at this point in time, therefore further impacts are expected beyond those measured here.

#### REACH:

To what extent has the AQ initiative been adopted by key stakeholders?

AQ reached all intended key stakeholder categories. Participation was highest amongst those identifying as start-ups and small and medium enterprises.

Participation from innovators and entrepreneurs in priority cohorts - female, Aboriginal and Torres Strait Islanders and those in regional and rural areas – was strong and increased over time.

Language enabled and inhibited reach. Where the terms innovation and entrepreneurialism didn’t cut through, reframing as ingenuity and continuous improvement helped.

#### EFFECTIVENESS:

To what extent has the AQ initiative delivered on stated objectives?

**KNOWLEDGE ECONOMY** AQ contributed to growth and productivity of Queensland’s knowledge economy and is helping support the diversification of Queensland’s economy.

#### SUPPORTING CULTURE

AQ helped grow community understanding and confidence in innovation and entrepreneurialism, and enhanced Queensland’s domestic and international reputation as a place to work and do business.

#### BUILDING CAPABILITY

AQ had a smaller focus on improving Queensland’s capability across the talent pipeline (school and university students, researchers) when compared to businesses but that wasn’t enough to outperform other states.

#### FOSTERING COLLABORATION

AQ facilitated a wide range of strong collaboration outcomes, ranging from confidence-boosting connections to formal business partnerships resulting in increase in profit and job creation.

#### INCREASING INVESTMENT

Despite slower growth in venture capital markets than in comparator states, Queensland businesses and Government demonstrated healthy investment in R&D.

#### SCALING FOR JOBS AND GROWTH

AQ contributed towards strong performance against objective of scaling for jobs and growth, with rising labour productivity, exports and an increase in the number of scale ups.

**IMPACT OF COVID-19:** The pandemic slowed growth across most metrics, yet it accelerated business agility and adoption of digital tools and technologies, including for AQ events.

**ALIGNMENT WITH AQ STRATEGIC PRIORITIES:** AQ strategy led to greater focus in late stage AQ programs (2019-2021).

#### EFFICIENCY:

To what extent has the AQ initiative provided value for money?

While it is empirically difficult to exactly attribute growth in macroeconomic variables (such as the GSP or jobs in the knowledge economy) to a single factor such as AQ, estimates by Nous show a Net Present Value (NPV) range of \$0.84 billion to \$1.65 billion, with a Benefit to Cost Ratio (BCR) range of 1.6 to 2.2. There is complexity in quantifying benefits. As such, it is prudent to focus on the lower end of the BCR and NPV as a central case.

### OPPORTUNITIES for Queensland government



#### REACH

Leverage digital uplift and apply lessons learnt on importance of language, local leaders and removing barriers for priority groups to further extend reach.



#### EFFECTIVENESS

Target investment to address collaboration and capability gaps; and secure ongoing funding for foundational programs (supporting culture and infrastructure).



#### EFFICIENCY

Further increase efficiency of its investment through targeted leveraging of public funds and avoidance of dependency on government funding.



#### SUPPORTING ECONOMIC GROWTH

Continue to use a portfolio approach to address market failures, including adding procurement to the mix of support for customers and accelerating paths to market.



#### PROGRAM DESIGN AND EVALUATION

Design programs to meet the needs of its target groups and prioritise consistently measuring key metrics to track outcomes from its investments.

# Executive Summary

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The executive summary outlines:

- Background and purpose of Advance Queensland
  - Purpose of the macro-level evaluation 2 and this report including a summary of the methodology that has informed this report and key data limitations
  - Summary of key findings, opportunities and lessons learnt for the Queensland Government structured by the key evaluation questions
- 

This report presents findings, opportunities and lessons learnt for the Queensland Government from the macro-level evaluation 2 of Advance Queensland (AQ), an ambitious suite of programs, strategies and funds aimed at transforming the state into a knowledge economy that attracts and supports innovation, entrepreneurialism, investment and research. This evaluation was commissioned by the Department of Tourism, Innovation and Sport (DTIS) and conducted by Nous Group (Nous) from July 2021 to January 2022 with the objective of understanding how successful AQ has been and what helped or hindered this success.

## Background and purpose of AQ

AQ was initiated in response to, and informed by, the findings and recommendations provided in the (unpublished) Lerner Report.<sup>1</sup> It was initially proposed as a \$50 million 2015 election commitment “to reinvigorate research, science and innovation to help create the well-paid knowledge-based jobs of the future”. The commitment was subsequently expanded and launched as the \$180 million AQ initiative, consisting of programs, strategies and funds aimed at developing, attracting and retaining scientific and entrepreneurial talent, stimulating collaboration, addressing big innovation challenges and attracting investment. From there, AQ was rapidly expanded into a cumulative \$755 million flagship initiative consisting of approximately 140 different programs and activities delivered by nine government departments.<sup>2</sup>

## Purpose of the macro-level evaluation 2

This macro-level evaluation 2 was commissioned to assess whether AQ has achieved its overarching objectives: growing, diversifying and strengthening Queensland’s knowledge economy, as demonstrated by its impact on a range of economic indicators relating to productivity, STEM careers, R&D, and other non-financial metrics. It follows the first macro-level evaluation conducted in 2019, which examined AQ’s implementation.<sup>3</sup> This evaluation also builds on several smaller micro and meso-level evaluations of specific programs, bundles of programs and partnerships within AQ.

This macro-level evaluation focuses on:

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<sup>1</sup> Lerner, 2014. Queensland’s Innovation Ecosystem and Recommendations for future actions (2014). Queensland Government (unpublished).

<sup>2</sup> Implementing agencies, in alphabetical order, are: DAF, DES, DESBT, DoE, DPC, DSDILGP, DTIS, Qld Health, Qld Treasury. See A.2 for full names of each department.

<sup>3</sup> Deloitte. 2019. ‘Advance Queensland: First Macro-Level Evaluation (Term 1) – Evaluation Report’. Department of Innovation, Tourism Industry Development and Commonwealth Games. Brisbane, Australia.

- **Reach:** examining the relevance and reach of the AQ initiative in addressing recognised needs and priorities, building on the findings of the first macro evaluation.
- **Effectiveness:** examining the extent to which the AQ initiative progressed in achieving the intended strategic objectives and contributed to building Queensland's knowledge economy.
- **Efficiency:** examining value for money of the AQ initiative in delivering initiative outcomes.

This report presents the findings based on qualitative and quantitative analysis of available data and outputs from stakeholder consultations. The findings and opportunities in this report aim to inform future Queensland Government decision-making and priorities and have been tested and refined with input from key stakeholders.

## Summary of the key findings, opportunities and lessons learnt for the Queensland Government

### Reach: To what extent has the AQ initiative been adopted by key stakeholders?

#### KEY FINDINGS:

**AQ reached all intended key stakeholder categories. Participation was highest amongst those identifying as start-ups and small and medium enterprises (SMEs).**

AQ reached all target groups, industries and regions, albeit to differing degrees over the years. The highest participation was from those in professional, research and scientific services; and those identifying as a start-up, entrepreneur, business or company – in line with recommendations of the Lerner Report. AQ increased its reach of intended stakeholders by more than three-fold between 2016-17 to 2020-21. Reach was extended through leveraging the networks and expertise of community and business leaders, and the trust these leaders and connectors held.

**Participation from innovators and entrepreneurs in priority cohorts - female, Aboriginal and Torres Strait Islander and those in regional and rural areas – was strong and increased over time.**

AQ programs, on the whole achieved inclusive reach as illustrated by the growing participation of females, Aboriginal and Torres Strait Islander and regional stakeholders. Both targeted and mainstream programs and activities are critical for increasing inclusion. There is an opportunity to scale up modes of delivery to further expand inclusion of stakeholders who are not currently targeted. The approaches used by the Deadly Innovation team appear particularly successful and are worth expanding to other cohorts and programs.

**Language enabled and inhibited reach. Where the terms innovation and entrepreneurialism didn't cut through, reframing as ingenuity and continuous improvement helped.**

Language was both an enabler and inhibitor – language used in the innovation sector did not resonate with many small businesses, especially in regional areas, who associated it with technology and 'trendy urbanites'. Reframing it as ingenuity and continuous improvement helped broaden understanding of the 'innovation' and boost support and interest for AQ.

**The impact of COVID-19 on AQ's reach was and continues to be mixed.**

COVID-19 accelerated the uptake of innovation as businesses had to become agile to deal with new situations. The example most observed was local businesses and industries seeking new, alternate products and partners due to broken or delayed supply chains, which benefited local Queensland enterprises. While online events enabled more people to connect, the need for in-person connections remains, especially for more complex collaborations and the building of trust.

## Opportunities to maximise Reach

- 1. The reach of AQ can be increased by leveraging local and industry leaders, networks and regional strengths.** The evaluation found that this approach led to better outcomes as a result of building on deep local knowledge and connections, in-tune to specific needs of regions/cohorts and in a language that “cut through”.
- 2. Hybrid (online and in-person) engagement is valuable and could be continued and enhanced.** Hybrid approach to delivery, networking and capability building has been well received by AQ participants from priority groups, particularly female entrepreneurs and those in regional areas. Now that hybrid events have been tried and tested as part of the COVID-19 response, they should become part of business as usual and be continually refined to maximise reach and value. This necessitates the use of hard infrastructure (such as QCN Fibre) and soft infrastructure (such as digital capabilities) to ensure effective participation and access.
- 3. Expand reach by building on effective approaches to engaging Aboriginal and Torres Strait Islander, female, and regional innovators to all key stakeholders, including, potentially, those from other groups that face structural barriers to their participation in the knowledge economy.** An opportunity exists to expand the definition of priority groups by adding other demographic groups that similarly face significant barriers to participation in the innovation ecosystem and knowledge economy, such as people with a disability, people from culturally and linguistically diverse (CALD) backgrounds, and people with very low socio-economic backgrounds.
- 4. Use language that is positive and readily understood by the target audiences.** To extend reach, the language of AQ programs and externally facing communications about innovation should adapt to encompass words and concepts that are readily understood such as ‘problem-solving’, ‘ingenuity’, preparing for the uncertain future, investing in science and technology, and leveraging R&D.

Refer to section **4.1 Reach: To what extent has the AQ initiative been adopted by key stakeholders?** for detailed findings and opportunities.

## Effectiveness: To what extent has the AQ initiative delivered on stated objectives?

### KEY FINDINGS:

#### Caveat

We acknowledge that each of these objectives have numerous factors that influence the initiative’s outcomes. Examining factors outside of AQ is largely out of scope for this evaluation, although they are acknowledged in relevant sections where appropriate. Examples of external factors include policy and programs implemented by the state and federal government at the same time as AQ, and the influence of trade and global events. For each objective area, further research and investigation of external factors could be conducted to better understand their influence and interaction with the AQ policy. Due to these external factors, it is near impossible to fully attribute benefits all to the AQ initiative. This section aims to show key areas and trends that AQ has contributed towards.

Below, the sections summarise performance analysis of various aspects of Queensland’s economy that AQ contributed to, in line with AQ’s five strategies, overall knowledge economy development and performance against strategic priorities. It also provides insights into unintended outcomes of AQ.

**Supporting Culture: AQ increased community understanding of innovation and entrepreneurialism, and enhanced Queensland’s domestic and international reputation as a place to work and do business.**

AQ’s programs captured under Supporting Culture appear to have been successful in increasing exposure to science, innovation and entrepreneurship, in turn raising their “profile” across a broad section of



Queenslanders. However, it appears that this interest has not been sustained, leading to opportunity to invest in maintaining the momentum and positive “buzz” built in early years of AQ.

Brisbane and Queensland have established a strong reputation (internationally and domestically) as a place not just to live, but also to work and do business, and this translates into strong domestic migration. Queensland now has the opportunity to leverage migration trends to grow knowledge economy capabilities and supply of talent.

AQ was one of the factors contributing to more favourable business environment, as indicated by improved business entry and survival rates in Queensland, but this still lags behind New South Wales and Victoria. Queensland’s interstate migration increase is an opportunity to encourage SME growth and innovation.

***Building Capability: Foundational innovation capabilities, such as STEM skills or use of innovative technologies, have developed at a slower rate in Queensland than in other comparator states.***

Despite some progress against objectives, more challenges remain under the building capability strategy than other strategies. One of positive findings is the productive output of Queensland’s researchers in national and international spheres. In particular, they are consistently outperforming most comparator states in producing which are highly cited, indicating that research coming out of Queensland is of high quality.

However, Queensland’s pipeline of future capabilities and talent remains insecure. When compared to other states, Queensland’s performance on key enrolment and academic performance STEM metrics is mixed. . This is exacerbated in regions where challenges in attracting and retaining talent (including trained maths and science teachers) are greater and are only expected to grow if overall talent pool becomes even more constrained.

Queensland has recently experienced a significant upswing in the use of digital and technology solutions. COVID-19 acted as a trigger for change, and AQ played a significant role in enabling the uptake, as evidenced by 93 per cent of AQ recipients reporting that they or their enterprise had ‘improved or made greater use of innovative technologies’ due to the support received. Despite this, Queensland still lags behind other jurisdictions in digital readiness, driven by lack of appropriate infrastructure, capability or confidence using technologies and awareness of benefits and opportunities offered by greater use of digital technologies. Without those foundational digital capabilities, Queensland businesses’ adoption of innovation will struggle to remain competitive in increasingly digitised world.

***Fostering Collaboration: AQ facilitated a wide range of strong collaboration outcomes for its participants, ranging from confidence-boosting connections to formal business partnerships resulting in increase in profit and job creation.***

Queensland businesses mirror Australian trend of low collaboration on innovation. However, businesses show recognition of the importance of innovation and seek out support through AQ and similar initiatives to overcome factors preventing them to collaborate, most frequently lack of time or funding. One of the consistently most praised achievements of AQ by participants has been the initiative’s facilitation of connections that led to a variety of positive outcomes for participants, ranging from inspiration to persevere to formal business partnerships that led to new enterprises.

But, when looking at collaboration in research on a macro level, results are mixed. Queensland’s researchers appear to be as collaborative as their interstate colleagues, both with other researchers and with the industries. However, while Australia sets a high benchmark for collaboration between researchers, its collaboration between industry and research is poor. This leads to opportunity to further incentivise collaboration between research and industry, given significant room to grow and potential beneficial outcomes for both sectors.

***Increasing Investment: Despite slower growth in venture capital market than in other states, Queensland businesses and state and federal government demonstrated healthy investment in research and development (R&D).***

Queensland businesses and government have demonstrated strong commitment to increasing investment in R&D, as shown by Queensland outperforming comparator states across government and business R&D investment metrics, as well as attraction of external R&D investments. Additionally, higher than comparator states number of patent applications suggests high level of productivity of the research conducted in Queensland.

Venture capital market capital has, on the other hand, grown more slowly than in comparator states. Government funding, and AQ in this case, is an alternative funding source to venture capital, with different decision-making criteria for investment. AQ participants have enjoyed greater access to capital, and reported stronger commercialisation outcomes as a result. There is an opportunity to explore how AQ funding could be further leveraged to address gaps in commercial funding mechanisms for innovation, primarily venture capital for better innovation outcomes.

***Scale for Jobs and Growth: AQ has delivered strongly on the objective of scaling for jobs and growth, with rising labour productivity, knowledge jobs and an increase in the number of scale ups.***

Innovation, when successful, leads to a wide range of other economic benefits – including job creation, increase in exports and business productivity (noting that all of those are reflected in aggregate GSP, so are not additional to the GSP impacts, but rather help to unpack those impacts into its components). AQ played a part in Queensland displaying strong performances across all of those metrics.

The number of scale-ups is often used as an indicator of future growth in jobs, profit and productivity. Scale-ups had a much higher growth rate since the introduction of AQ than before AQ, based on a novel analysis of Queensland payroll tax data, which Nous developed for this evaluation. We suggest monitoring this indicator in the future. Queensland has also been outperforming comparator states in multifactor productivity and export growth, showing that strong jobs, revenue and productivity outcomes reported by AQ participants are likely translating to the wider economy.

***Building the Knowledge Economy: AQ contributed to growth and productivity of Queensland's Knowledge Economy***

The results indicate that AQ may have partly contributed to Queensland's impressive knowledge economy performance, with increases in GSP, businesses growth opportunities, employment and wages. While the economy became slightly less diversified over the lifetime of AQ, it was during a period where mining is a significant driver of economic growth. In comparison, other jurisdictions like Western Australia, with a similar economy, became somewhat less diversified than Queensland. Relatively speaking, Queensland maintained a somewhat more diverse economy over that period than Western Australia, mostly likely due to its focus on a diversified economy.

The real GSP of the knowledge economy in Queensland grew by 2.15 per cent per annum, from 2014-15 to 2020-21 (see Figure 42). This was a higher rate of growth than the Queensland economy as a whole, which grew by 1.83 per cent over the same six-year period. The knowledge economy generates \$130 billion per annum, the AQ initiative, of \$755 million, along with other investments from the Queensland Government and the Commonwealth funding of innovation and entrepreneurial programs over the same period has contributed to this growth.

***Priorities in the 2019 AQ Strategy: Progress has been made against all priorities, however challenges and opportunities remain.***

While the four strategic priorities were only introduced in 2019, initial analysis indicates that the priorities identified through the AQ Strategy supported focusing of programs, shifting from broad capability

building programs to more targeted initiatives to support regions, priority industries and build specific capability.

While progress has been made on each of the priorities in the strategy, key challenges remain, and range of opportunities therefore present themselves to continue to progress these priorities and the future directions outlined in the Strategy.

**Priority Industries: Development of priority industries remain important for government, however assessment of reach and effectiveness is hampered by data limitations**

Importance of a multifaceted role of government, and innovation within it, is clear and strongly recognised by stakeholders. However, there is limited clarity in distribution of roles and responsibilities between Government Departments; and opportunity for better alignment between them in achieving a shared objective of industry development.

AQ supported development of priority industries through funding for development and implementation of a portion of roadmaps. Initial data is showing that funding is flowing to those industries as intended. However, fully quantifying and understanding reach and effectiveness of AQ's investment is difficult due to data limitations, in particular inconsistent definition of priority industries, incomplete reporting due to distributed ownership and funding and long lead times in seeing impact due to 10-year industry development horizon.

**Unintended Outcomes: There were no major negative unintended outcomes, and a wide range of positive outcomes reported by participants was planned by program designers.**

AQ is a large and complex initiative. While focus group participants reported isolated and anecdotal incidences of crowding out, administrative burden and dependency on government funding, the evaluation didn't find any major negative outcomes, indicating that the program was designed and implemented well, despite the complexity in its aim and delivery environment.

Participants did report a wide range of positive unexpected outcomes, but in most cases, those were intended by program designers and administrators. Additionally, COVID-19 has unexpectedly led to accelerated achievement of some of AQ's outcomes, particularly as they relate to adoption of digital tools and innovative processes.

**Snapshots**

Figure 1 shows a snapshot of key AQ effectiveness metrics providing the latest performance and trend since the baseline was established (refer to Appendix F – Overview of Queensland performance on key metrics for more information and baseline dates).

Figure 2 shows a snapshot of the survey conducted to understand the impact of AQ and inform the evaluation (refer to Appendix D.2.1 for further details).

Figure 1 | Snapshot of key AQ effectiveness metrics

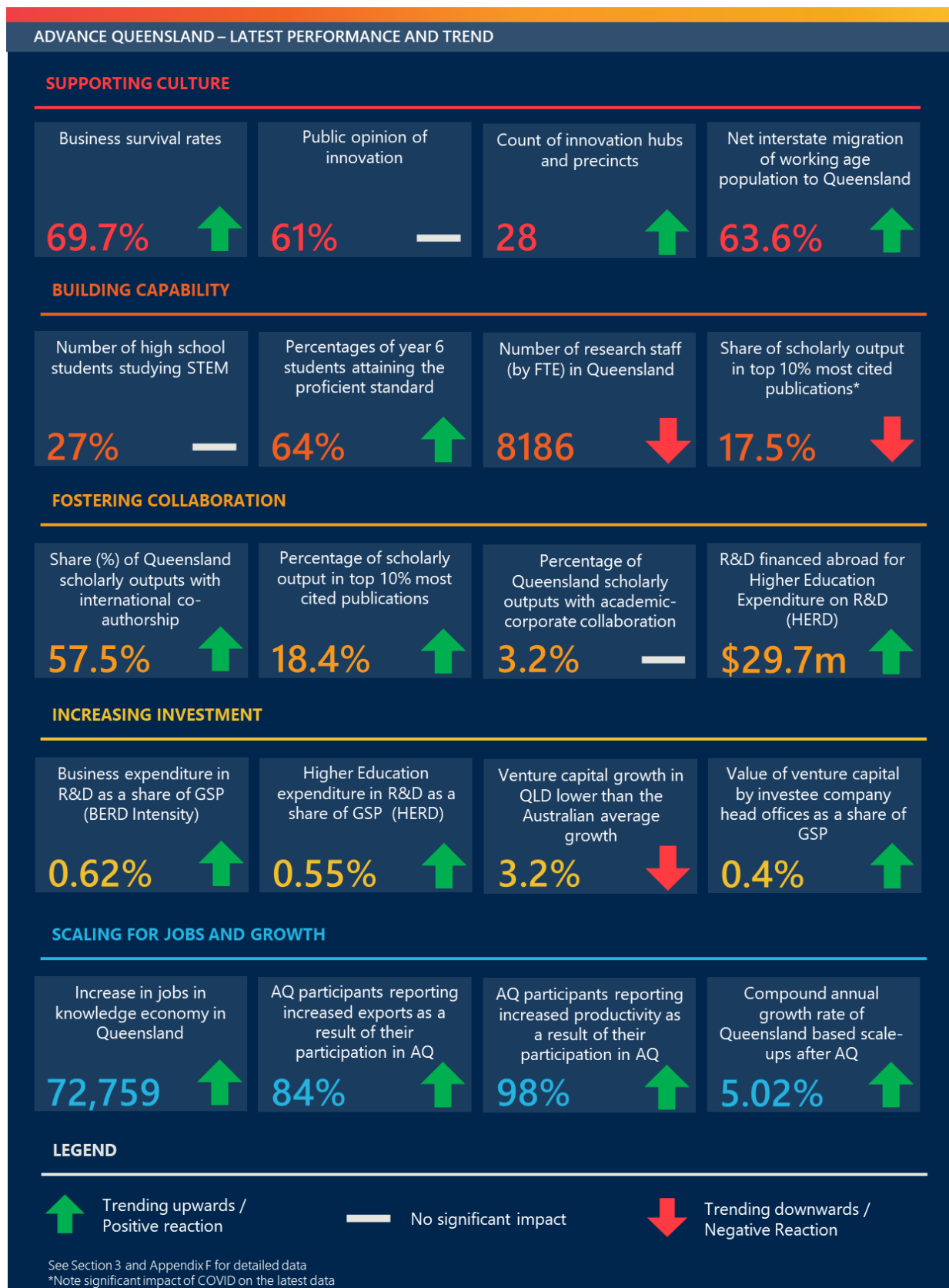


Figure 2 | Snapshot of AQ survey



## Opportunities to maximise Effectiveness

5. It is important for the Queensland Government to regularly invest in broad-reaching programs to maintain a strong culture of innovation and entrepreneurship, and awareness of these initiatives, as this is critical first stage of the 'innovation pipeline'. Queensland Government can maintain momentum through regular investment in broad-reaching programs that build culture of innovation and entrepreneurship, accompanied by promotion of new and ongoing initiatives and communication of program outcomes.
6. More programs and funding should focus on talent development and supporting pathways to knowledge industry careers, including and beyond STEM. Building STEM capability was a small portion of overall investment; and evaluation findings show that more needs to be invested to build a strong pipeline of talent. Further, while STEM subjects are associated with innovation and entrepreneurial activity, this needs to be complemented by capability in commercialisation.
7. Introduce incentives and mechanisms for deep reciprocal engagement between industry and research, including commercialisation to increase collaboration among Queensland researchers with industry which remains low by international standards. This could include facilitating more efficient connections between researchers and entrepreneurial organisations, recognising and funding career pathways that span both academia and industry (incl. entrepreneurial doctorates), supporting collaborative project with clear commercialisation benefits initiated by the industry.
8. Complement "physical" innovation infrastructure with necessary information systems and operational funding within innovation places, through systematic use of customer relationship management (CRM); sustainable operational funding to hubs and innovation centres to maintain programming and maintain infrastructure; and established key performance indicators (KPIs) (including from outcomes across all five AQ strategies) to monitor and assess outcomes through program evaluation).
9. AQ funding has an opportunity to complement VC funding and/or channel funding into important opportunities that fall outside of VC funding. This might mean supporting high-potential innovations in early stages of commercialisation, innovators located outside of large urban hotspots and/or established SMEs.

Refer to section 4.2 *Effectiveness: To what extent has the AQ initiative delivered on stated objectives?* for detailed findings and opportunities.

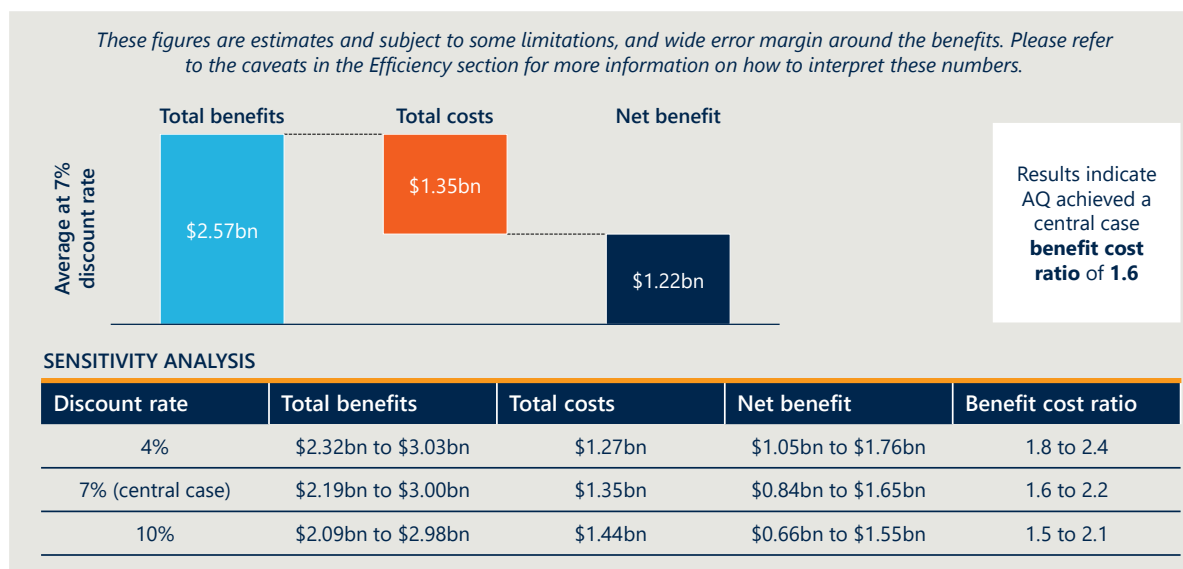
## Efficiency: To what extent has the AQ initiative provided value for money?

### KEY FINDINGS:

Cost benefit analysis (CBA) measures the benefits to all Queensland residents, not just to the government's bottom line, and this could be in the form of higher wages for Queenslanders, or higher profits for Queensland-based business owners. The Net Present Value (NPV) of benefits minus costs from this analysis is a range of \$0.84 billion to \$1.65 billion, with a Benefit to Cost Ratio (BCR) range of 1.6 to 2.2. This means AQ likely delivered more benefits to Queenslanders than it cost by a ratio of at least 1.6 to 1. There is complexity in quantifying benefits. As such, it is prudent to focus on the lower end of the BCR and NPV as a central case.

## Early indications show that AQ provided a healthy return on investment

Figure 3 | Illustrative CBA results



Conducting a CBA of AQ at this stage is difficult as some of the outcomes are yet to materialise in economic indicators, so the results are an indicator of the success of AQ up to 30 March 2021. At the time of writing this report (and the data it relies on) approximately \$167 million in AQ funding is committed but still to be spent. Many effects (both positive and negative) are likely to emerge over the next five years. Some of these effects may be unpredictable. Therefore, this CBA analysis should be taken as an illustrative estimate and considered in context with the rest of this report. It is limited by several factors, such as COVID-19 and a lack of data points to allow us to control for other external factors.<sup>4</sup>

To approximate the benefits of AQ, Nous used three methods and averaged them:

1. Benefit attributable to productivity increases, based on the literature on innovation funding that compares results of similar innovation programs in other jurisdictions.
2. Outperformance of the Queensland knowledge economy against underlying trends, growth benchmarks and other jurisdictions.
3. Increase in business revenue above baseline attributable to AQ as supported by survey findings (of both recipients and participants, and enterprises that did not engage with AQ).

The real economic cost of AQ is different to the direct fiscal outlays and includes \$965 million in further investment leveraged from partners, estimated government administration costs (an upper bound was used, based on a subset of programs for which data were available). The cost to the economy was arguably lower than this, as some of the funds were transfers<sup>5</sup> to supplement the income of research fellows, PhD students, innovators and others. Other funds more directly incurred a real cost to the Queensland economy, and some funds were injected from outside the state, so came at no direct cost to Queenslanders. The overall net present value (NPV) of AQ costs (including the costs associated with matched funds) was estimated at \$1.35 billion in 2021 dollars, using a 7 per cent real discount rate to escalate funds spent prior to 2021 up to their present value, or to discount remaining funds to be drawn

<sup>4</sup> In econometrics terminology, insufficient degrees of freedom were available to make valid statistical adjustments for external factors such as Commonwealth funding or other economic trends occurring simultaneously with AQ, which may have influenced observed knowledge economy growth. These issues are examined qualitatively and descriptively in the main body of the report.

<sup>5</sup> A payment such as a prize or scholarship is not a 'real' cost to the economy, as it is a transfer of income from one Queensland (taxpayers) to another (scholarship recipient), rather than government investments that incur real costs, such as bricks and mortar. Similarly, investments leveraged from overseas companies like Boeing do not impose a cost on the Queensland economy.

down in the future back to 2021. This cost side of the CBA was able to be measured with much greater accuracy than the benefits side of the CBA.

The evaluation didn't identify any areas of significant duplication. Some AQ recipient organisations reported in focus groups that they participated and benefited from multiple programs, but this was often by design, as those programs contributed to distinct outcomes for participants. However, some stakeholders did believe there to be minor duplication of AQ funds with Commonwealth and private funding.

### Opportunities to maximise Efficiency

- 10. Broaden options for 'leveraging' public funds beyond the State.** AQ has been successful at 'leveraging' public funds with investment from sources outside the Queensland Government, including the private sector and not for profit organisations (NFPs). However, this could be more nuanced: for example, attracting a greater share of Commonwealth R&D funds, or additional investment from non-Queensland-resident investors is more important at growing the size of the Queensland pie than distorting the investment decisions of Queensland-resident firms.
- 11. Build in sustainability considerations when awarding funding to avoid creating dependency.** AQ funding at times resulted in businesses that are not commercially viable being supported over a prolonged period of time, and no longer continuing when that funding is no longer available. Queensland Government could continue and expand good practices in ensuring sustainability of businesses beyond funding end date, by including sustainability assessment when funding is awarded, embedding sustainability considerations into contract KPIs and gradual funding withdrawal.

Refer to section **4.3 Efficiency: To what extent has the AQ initiative provided value for money?** for detailed findings and opportunities.

## Lessons learnt: To inform future Queensland Government decision-making and priorities

Lessons learnt from the AQ initiative will be valuable to inform future government priorities including the role of government in supporting innovation driven economic growth and the role of evaluations in supporting continuous improvement in program design and delivery.

Lessons learnt on the role of Queensland Government in supporting innovation driven growth (points A to D); and continuous improvement in program design and evaluation (points E to J) are outlined below.

### Role of Queensland Government in supporting innovation driven growth

- A. The Queensland Government can continue to use a portfolio approach to grow the knowledge economy.** Appropriateness of portfolio approach adopted by AQ has been reinforced through literature and evaluation consultations, as it allows for investments of mixed risk profiles and investment strategy changes based on emerging ecosystem needs.
- B. Queensland Government can continue to identify market failures and use targeted investments to 'fix' them and assist the economy to grow by opening new areas.** In particular with investors, research community and other government levers focusing on weak points along the innovation value chain, continuing Queensland Government's track record in going beyond just ensuring that legislative, regulatory and policy settings enable and do not hinder innovation.
- C. Queensland Government should review its procurement strategy to better support Queensland's innovation ecosystem** and assist small and innovative businesses in Queensland to commercialise their products and ideas developed with the help of AQ, while also amplifying the government's return on investment, in turn enabling these businesses to scale and generate local jobs.



- D. **Define clear ownership for priority industry development, role of innovation within it and reporting requirements**, to ensure that roles and responsibilities between government departments are clear, and reporting is accurate, complete and granular enough to allow for understanding of impact into priority industries.

### **Continuous improvement in program design and reporting**

- E. **Program design should balance the need for fast-paced decision making often necessary in the 'innovation industry' with the need to provide sufficient certainty through advance notice and longer-term programs.** To achieve this, consider allocating a proportion of funds for time-critical opportunities that would otherwise be missed, taking a longer-term approach to program design (but with built-in adaptability) and providing advance notice of major investment opportunities requiring institutional collaboration or co-investment.
- F. **It is imperative to embed outcomes measurement and reporting to demonstrate value of each program, especially those attracting greater public or political scrutiny.** Future programs could draw on examples of good practice when designing and implementing any programs and justifying the use of taxpayer funds on valid programs that could have the appearance of a 'junket' by demonstrating the tangible and quantifiable benefits these bring to the state.
- G. **Grant recipients need to be accountable and demonstrate outcomes for government money received**, including reporting on short- and medium-term outcomes (beyond the funding term) that serve as leading indicators to achieving long-term objectives.
- H. **Queensland Government could recruit and/or engage more with experts who understand market realities and specific subject matter (where investment is targeted) to add input for sound program design and decision-making.** This will ensure that in-depth market understanding, including best practice and industry trends is considered in program design, and appropriate technical input is considered in funding decisions and contract management.
- I. **Queensland Government should define key terms, measures/indicators and calculate baselines of key metrics prior to expending funding.** For example, if rolling out a similar program in the future, it is important to define which sectors make up the knowledge economy and how fast the knowledge economy would be expected to grow with or without AQ. This will assist with evaluations and monitoring of the program.
- J. **Nous has developed novel measures to track innovation performance as part of this evaluation. The Queensland Government should continue to annually update and monitor these informative new measures.** In order to measure macro-level benefits driven by AQ, a number of 'non-standard' measurements were adopted to separate AQ from other socioeconomic influences - these should be continually monitored to provide greater insight into the impact of innovation on the Queensland economy. These include a measure of scale ups based on payroll tax data, a definition of the "knowledge economy" GSP and jobs, and a Herfindahl-Hirschman Index of economic diversification by State.

Refer to section **5 Lessons Learnt** for detailed findings and lessons learnt.

## 2 Introduction

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This introduction includes:

- Background to AQ and Queensland's innovation agenda
  - Overview of AQ
  - Direct outputs and outcomes of AQ
  - Purpose and scope of the macro-level evaluation 2
  - Purpose and structure of this report
- 

### 2.1 Background to AQ and Queensland's innovation agenda

Queensland has traditionally had four core pillars that have supported its economic growth: agriculture, construction, tourism, and mining. These industries have been the primary drivers of Queensland's maturation into a modern economy and supported the above average economic growth and strong employment growth. By the late 1990s, debate was growing over how Queensland can modernise its economy to ensure that its growth continued long into the 21<sup>st</sup> century once the State's natural resources inevitably drew towards depletion.<sup>6</sup> Thought centred on developing a knowledge economy, recognising that in a modern economy, high-skilled, high-paying roles come primarily from knowledge intensive sectors (defined in Appendix D, Section D.1.1).

The Smart State Strategy was the government's documented approach to transitioning Queensland towards this knowledge-based economy, by broadening the Queensland economy from a resource and agriculture base by creating new industries and making traditional industries *smarter*. It was launched in 1998 and over the strategy lifetime resulted in a total investment of approximately \$8.2 billion (\$4.9 billion by the Queensland Government and a further \$3.3 billion in external investment), the establishment of the Queensland Innovation Council (1999) and publication of the *Queensland the Smart State – Investing in Science: Research, Education and Innovation strategy* in 2003. This strategy focused on key innovation areas and formed Queensland's initial attempt to transition to a knowledge-based state leading to the creation of 36 new research institutes, more than 230 research scholarships and fellowships, and Queensland's first government-appointed Chief Scientist.

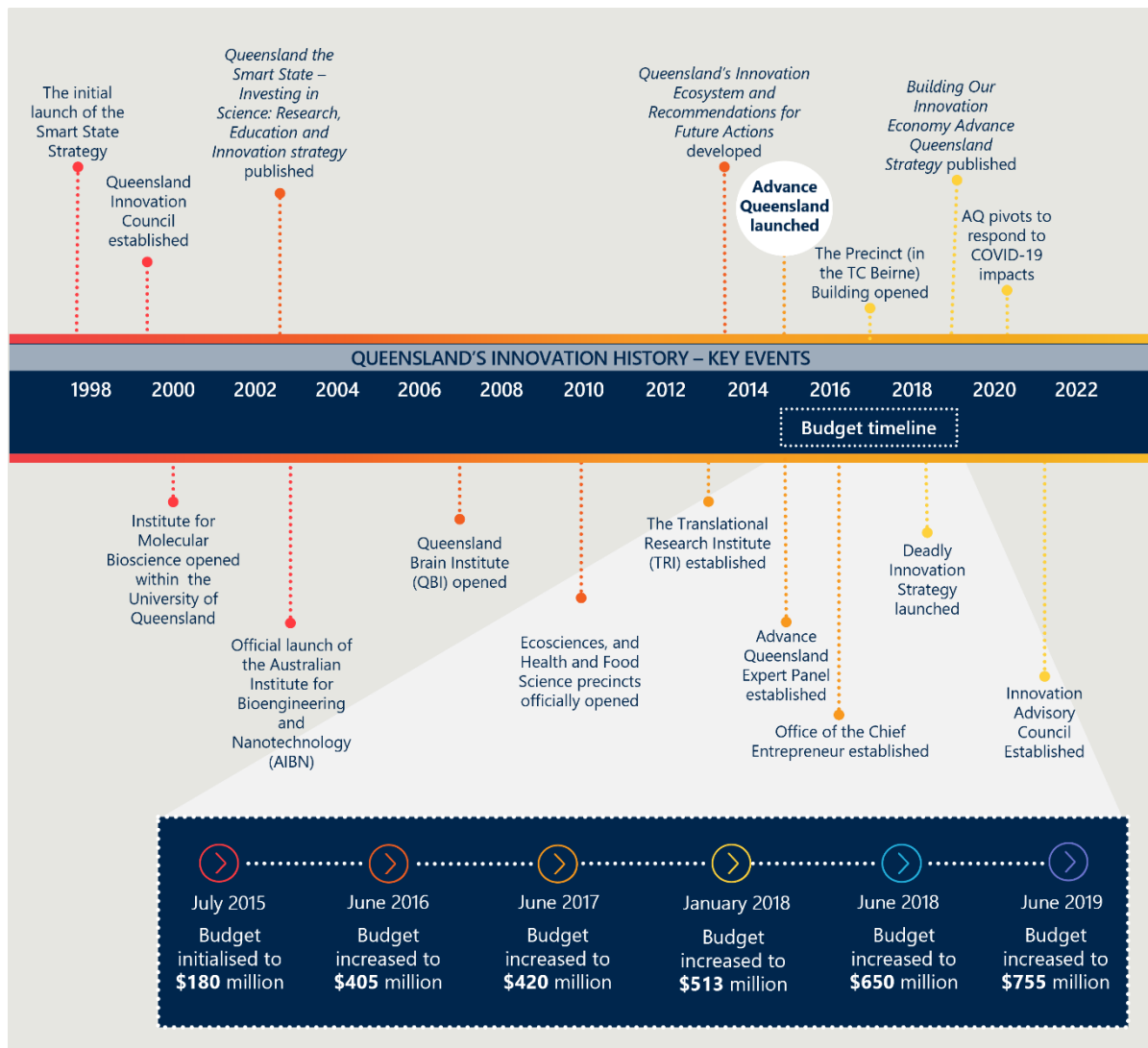
Following on from the success of the Smart State initiative, the Queensland Government recognised there was further work to do to continue modernising the economy. The resources investment boom was winding down and Queensland had to once again evaluate how it was going to grow its economy in the future. In 2014, the Queensland Government engaged Professor Josh Lerner from Harvard University to research how Queensland could get maximum value from investing in innovation, resulting in the development of *Queensland's Innovation Ecosystem and Recommendations for Future Actions* (the Lerner Report, unpublished), a report on the (then) 'current state of innovation in Queensland and recommendations on how to improve it'. This research highlighted the importance of entrepreneurialism, R&D, and employment in knowledge intensive sectors for economic growth. It outlined the strengths and weaknesses of Queensland's innovation economy against those of other jurisdictions and global

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<sup>6</sup> Salisbury, Christopher Graham. 2013. 'The 'smart' state: building a knowledge economy in Queensland since the 1990s': *PhD Thesis*

comparators, providing the basis for the AQ initiative. Figure 4 illustrates the policy development and budget over time.

Figure 4 | Queensland’s innovation history and AQ budget timeline



## 2.2 Overview of AQ

The strategic objectives of AQ were informed by the findings and recommendations provided in the Lerner Report. It was initially proposed as a \$50 million 2015 election commitment “to reinvigorate research, science and innovation to help create the well-paid knowledge-based jobs of the future”<sup>7</sup>. The program was expanded before launching into the initial \$180 million AQ investment, a knowledge economy initiative to create the knowledge-based jobs of the future, drive productivity improvements and build on our natural advantages. This initiative aims to position Queensland as a globally recognised place where industry, universities and government work cohesively to move good ideas through the innovation system, attracting investment and talented people and creating new products, companies and jobs.

<sup>7</sup> Queensland Government Media Statement (17 February 2015): Premier to work side by side with industry

From there, the program was rapidly expanded into a \$755 million flagship initiative over the course of the following four years, consisting of approximately 140 different programs and activities. A timeline of these budget increases is shown above in Figure 4.

## Governance

As funding expanded, the responsibilities of delivering the programs expanded across nine government agencies (see Appendix A.3). Given the complexity of delivering a large initiative across many parties, AQ required a strong governance approach. Governance arrangements are reviewed on a regular basis to ensure they remain fit for purpose. A high-level overview of the existing governance structure is provided below at Figure 5.

Figure 5 | AQ Governance Structure



## AQ frameworks and strategies

In 2015, the *Advance Queensland Policy Framework* was developed, outlining five key strategies and ten objectives to guide the design, implementation and evaluation of AQ programs. These strategies collectively target weaknesses in the innovation system (as identified through the Lerner report).

In 2017, an internal *Organising Framework* comprising five themes was developed to provide a basis for reporting on the progress and performance of the initiative. While programs may contribute to one or more of the AQ strategies and objectives, they are only included under a single theme (which is aligned to a primary strategy and associated objectives).

The *Advance Queensland Handbook* was developed and used to provide a comprehensive guide to achieving a consistent approach to planning, implementation and evaluation of AQ activities within participating agencies. Key elements of the handbook include:

- *Policy Framework* – outlines the rationale and overarching aims of AQ
- *Organising Framework* – outlines all programs and activities, and clarifies and confirms their key attributes including status, program type, funding arrangements and lead agency

- *Governance Framework* – outlines the governance arrangements that manage implementation of the AQ initiative
- *Reporting Framework* – outlines reporting requirements and mechanisms
- *Evaluation Framework* – outlines the approach and high-level strategy for evaluation. The AQ Evaluation Framework is designed to ensure a coordinated approach to reviewing implementation of AQ and measuring its outcomes and to inform future investment and policy direction.
- *Grants Management Framework* – provides a comprehensive guide to achieving a consistent approach to planning, implementation and evaluation of AQ activities within participating agencies.
- *Risk and Issue Management Strategy* - describes roles and responsibilities and the specific risk and issue management techniques and standards to be applied to the AQ initiative.

In 2019, the Queensland Government released the *Building Our Innovation Economy - Advance Queensland Strategy*. The strategy outlines key priorities in further enhancing the growth of Queensland's knowledge economy, as well as key directions and future strategies (Appendix F). These priorities cross over the AQ Strategies, Objectives and Themes (see Figure 6).

AQ has also identified the following target cohorts:

- Aboriginal and Torres Strait Islanders who are business owners, innovators, researchers and students
- female<sup>8</sup> business owners, founders, innovators, researchers, future entrepreneurs
- people, companies and other entities in regional, rural and remote parts of Queensland (defined as beyond Greater Brisbane).

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<sup>8</sup> In this evaluation, 'female' is used inclusively to describe stakeholders who identify with the 'female' sex category and 'women' gender identity. Program data collected for reporting uses the female descriptor. It is recognised that 'woman/ women' may be seen as a more appropriate descriptor for gender identity but for the purposes of alignment with AQ reporting, the evaluation uses the 'female' descriptor.

Figure 6 | AQ Framework

## Framework for Advance Queensland

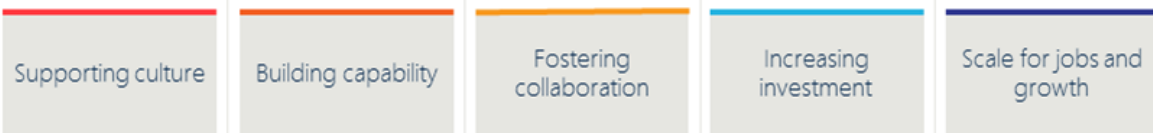
### VISION

A state made for innovation - where ideas matter, collaboration takes us further faster, and local innovation spurs productivity, creates jobs and builds our quality of life

### KEY PRIORITIES



### STRATEGIES



### THEMES



### OBJECTIVES



Source: Adapted from *Building our Innovation Economy – Advance Queensland Strategy*

### Programs and activities overview

The large scale and diverse portfolio of the AQ Strategy is delivered via nine government departments.<sup>9</sup> This has been done through approximately 140 programs and activities which broadly align with one of the following types:

- **Grants** – funding provided to defined entities for a specific purpose or project under a structured program which includes an application, assessment, decision, and funding agreement process

<sup>9</sup> Advance Queensland Organising Framework – outlines the programs and activities that contribute to Advance Queensland goals and objectives

- **Partnerships** – Financial contribution to one-off strategic projects or organisations to support unique opportunities
- **Competitions** – a contest in which people or companies take part in order to win a defined end-prize
- **Procurement** – obtaining goods or services in a fair and equitable manner that aligns with AQ strategic goals
- **Events** – an event for external participants that is funded by, and/or supports AQ aims, objectives or programs
- **Sponsorships** – provision of financial support for an external event or activity
- **Foundations and administrative activities** – activities to support the delivery and governance of the initiative.

*See Appendix B for a list of key programs.*

### Program implementation and performance reporting

In December 2016, the then AQ Interdepartmental Committee endorsed an approach for reporting on the status, achievements, data and funding commitments for all AQ initiatives across Queensland Government agencies.

All AQ initiatives report quarterly on implementation and performance, providing a consolidated view of the progress of the initiative against key measures, including:

- Program status (programs launched, rounds opened/closed, events held)
- Program budget (expenditure, funds contractually committed)
- Innovators reached (applications received, attendance at events)
- Innovators supported (recipients of grants, prizes and opportunities)
- Funds leveraged (funds contractually committed by program partners)
- Jobs supported (new Queensland jobs reported, new Queensland jobs forecast).

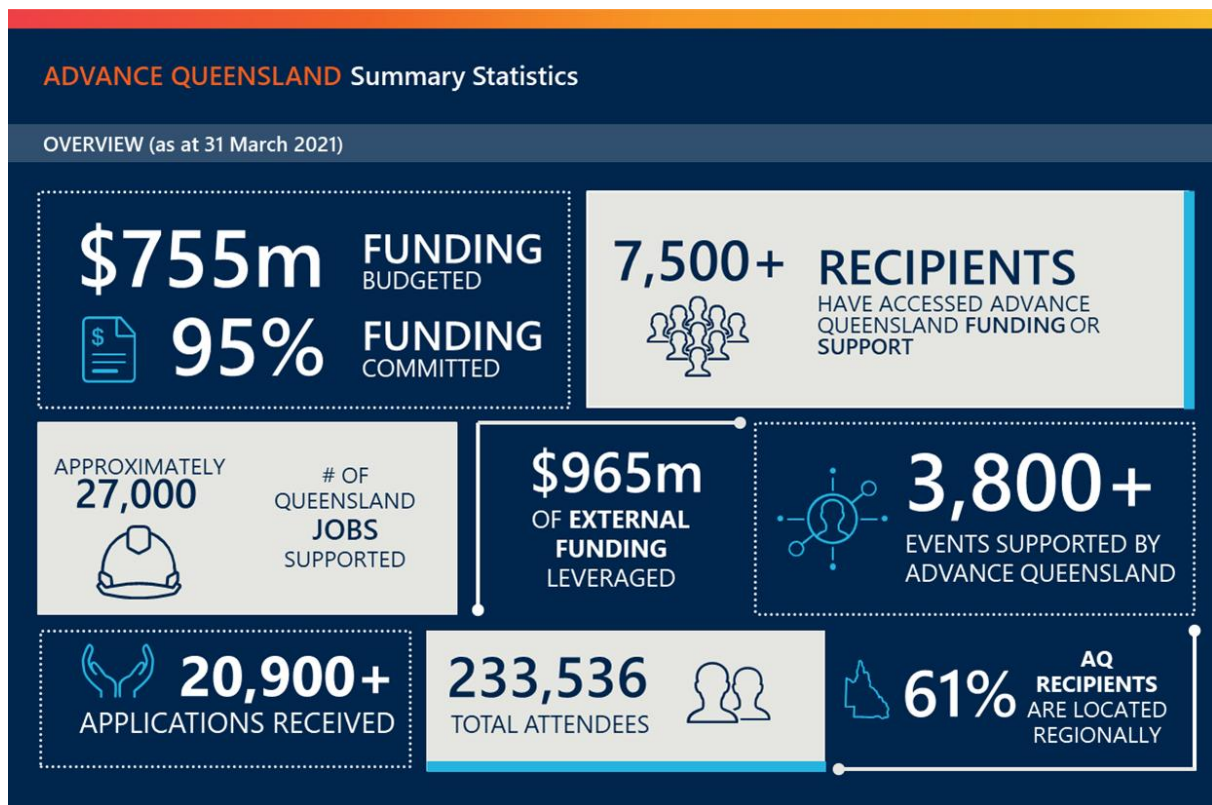
Implementing agencies and business areas are provided with reporting templates and guidance material and are requested to review and quality assure data before submitting to the Program Design and Insights Team, in the Department Tourism, Innovation and Sport (DTIS).

See Appendix A.3 for further information.

## 2.3 Direct outputs and outcomes of AQ

Over the life of AQ, the initiative reached a significant number of innovation ecosystem participants; and its programs delivered a number of benefits for the ecosystem, including new jobs. A snapshot of direct outputs and outcomes of AQ is shown in Figure 7 below.

Figure 7 | Direct outputs of AQ



Source: Advance Queensland Reporting

While important to acknowledge what AQ delivered for the ecosystem, the remainder of the document will be focusing on its impact on the ecosystem as a whole, beyond its members who directly participated and benefitted from AQ initiatives. However, because of the strong capability building focus of AQ, it is important to appreciate that its impact extends beyond just the ecosystem members that directly participated in the initiative, as it laid foundations and enabled outcomes beyond its direct reach.

**This is why AQ will be considered as an important contributor to the growth and development of the ecosystem, while acknowledging that it is only one of the multitude complex factors that influence the ecosystem and more broadly Queensland economy.**

## 2.4 Macro-level evaluation 1

The first macro-level evaluation of AQ was conducted in 2019 at a whole-of-initiative level and took into account all programs and activities between 2015-16 and 2017-18.

The macro-level evaluation 1 assessed:

- key achievements and benefits of AQ, including outputs and intermediate outcomes
- extent to which AQ has met the needs of and been adopted by key innovation system
- participants, as well as key demographics such as female, regional and Aboriginal and Torres Strait Islander entrepreneurs
- delivery against AQ strategies and objectives.



The macro-level evaluation 1 comprised:

1. A process evaluation that investigated the extent to which AQ has been implemented as intended, has successfully reached the target audience and the extent to which the governance has supported the implementation of the initiative.
2. An effectiveness evaluation that investigated the extent to which AQ is responsible for a particular outcome or outcomes.
3. An efficiency evaluation that investigated the extent to which AQ is delivered at the lowest possible cost, to the areas of greatest need, and continues to improve over time by finding better or lower cost ways to deliver outcomes.

Findings from the first macro-level evaluation informed the *Building our Innovation Economy: Advance Queensland Strategy*.

## 2.5 Purpose and scope of the macro-level evaluation 2

The macro-level evaluation 2 was conducted by Nous from July 2021 to January 2022 with the objective of understanding how successful AQ has been and what helped or hindered this success. The objectives of the macro-level evaluation 2 of AQ are to:

- Examine the relevance and reach of the AQ initiative in addressing recognised needs and priorities, building on the findings of the first macro evaluation (which focussed on implementation).
- Assess the effectiveness of the AQ initiative in achieving the intended strategic objectives and vision and contribution to building Queensland's knowledge economy.
- Assess the efficiency (value for money) of the AQ initiative in delivering initiative outcomes, specifically focusing on technical (delivery at lowest cost) and allocative (meeting greatest needs within set resources) efficiencies.
- Assess the contribution of the AQ initiative to growing and strengthening Queensland's economy; and supporting transformation to a knowledge economy.
- Identify lessons learnt about government investment in innovation driven growth.
- Identify opportunities to maximise reach, effectiveness and efficiency of AQ, to inform future innovation priorities, Queensland Government intervention and investment and contribute to the development of best practice guidelines.

The scope for this macro-level evaluation 2 includes consideration of the sum of approximately 140 AQ programs and activities, rather than assessments of individual programs. It focussed on the overall impact of the AQ initiative and has highlighted selected activities or programs to assist in the illustration of key findings.

The evaluation was delivered over three stages from July 2021 to January 2022. The evaluation had an emphasis on three key evaluation questions: reach, effectiveness, and efficiency. Refer to **Section 3: Methodology** for the evaluation methodology, key data sources that inform this report, and key limitations.

## 2.6 Purpose and structure of this report

### **This report provides findings from the evaluation and opportunities for the Queensland Government**

This report comprises:

- Findings about the extent to which AQ reached its intended audience, its impact on growing Queensland's knowledge economy and value-for-money of the investment in AQ.
- Opportunities for Queensland Government to define future innovation priorities, government intervention and investment and contribute to the development of best practice guidelines.

This report analyses AQ from 2015-2021, using data sources as defined in Appendix D, noting that trends are often observed from 2015-2019 to account for the disruptive impact of the COVID-19 pandemic. Nous delivered the draft final report at start of December 2021, and final report (this report) at the end of January 2022.

This report provides findings in the following sections:

- **Section 3: Evaluation methodology**, including data sources that inform this report and key limitations.
- **Section 4: Evaluation findings and opportunities** structured against the Key Lines of Enquiry (KLEs), with the effectiveness component further broken down into the five key system level AQ strategies and building the knowledge economy.
- **Section 5: Lessons learnt**, overarching lessons learnt to inform future government decision-making and priorities.

Throughout the report, there are:

- AQ participants quotes taken from interviews, focus groups and survey responses to illustrate first-hand experiences of AQ.
- Graphs showing Queensland's performance across macro-level indicators relevant to each area examined.

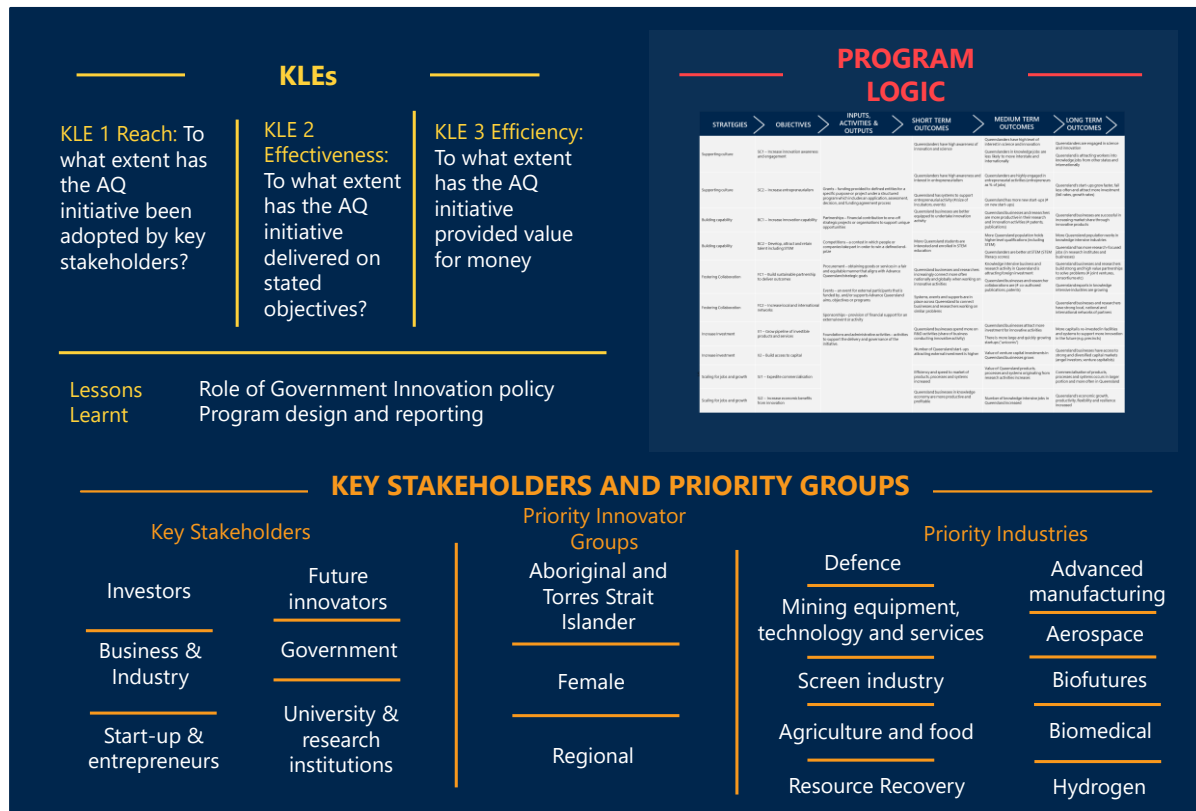
# 3 Methodology

This section summarises the evaluation methodology, key data sources that inform this report, and key limitations.

## 3.1 Evaluation methodology

This evaluation uses mixed methods to conduct the cost benefit analysis and assessment of reach, effectiveness and efficiency. The analysis has focused on the overall impact of the AQ initiative and highlights selected activities or programs to assist in the illustration of key findings. The approach has been structured around three core KLEs, which are further supplemented by a program logic. The program logic model supports the identification and evaluation of the links between AQ objectives, activities, outcomes and impact (see Appendix C).

Figure 8 | Evaluation framework key elements<sup>10</sup>



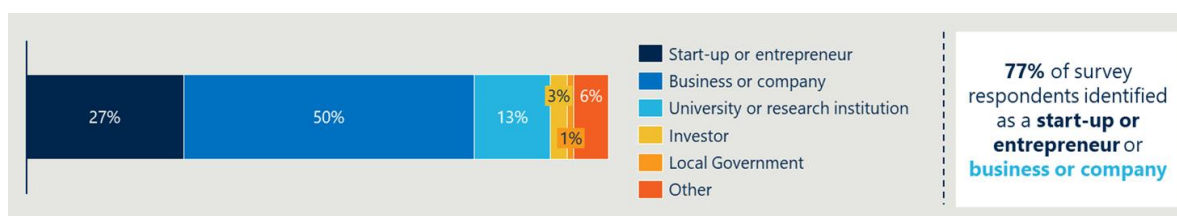
<sup>10</sup> Key stakeholder groups are key innovation system participants as defined in the AQ Evaluation Framework (2019).

## 3.2 Data sources informing the findings

The methods used in this evaluation draw on qualitative and quantitative data sources to triangulate findings. Sources and methods include the following:

- **Document and literature review:** Nous has undertaken a review of the documents and analysis provided by DTIS and done broader research on the innovation landscape. This information supports many sections of this evaluation. For example, data from existing surveys and findings from previous evaluations have been used to supplement insights.
- **Program data:** Nous has used whole-of-initiative performance and implementation data collected and provided by DTIS to inform our analysis on the reach of AQ and to determine the costs of AQ for the purposes of the cost benefit analysis. This data covers the period from July 2016 to March 2021, however formal reporting commenced in December 2016<sup>11</sup>.
- **Publicly available data:** Given the focus on macro-measures in the Queensland economy, much analysis could be based on publicly available data procured by various government agencies and other sources. For example, a considerable amount of analysis is based on data provided by the Australian Bureau of Statistics (ABS).
- **Other restricted datasets:** This included restricted data from the ABS' Business Longitudinal Analysis Data Environment (BLADE) which was processed and provided by DTIS, information on the number of 'scale ups' which was processed and provided by Queensland Treasury's Office of State Revenue, and the Longitudinal Australian Business Integrated Intelligence (LABii) developed by Queensland University of Technology.
- **Stakeholder engagements:** Nous has engaged with over 60 stakeholders through interviews, focus groups and workshops to gather perspectives on the impact of AQ. These engagements have revealed valuable insights, the synthesis of these are included throughout this report.
- **Survey:** Nous conducted a survey of Queensland residents and businesses to capture the impact of AQ and quantify the potential costs and benefits associated with AQ participation and those that did not participate. The survey covered approximately 40 questions on motivations, benefits, and impacts of COVID-19. It had 1,254 total responses, of which 945 were validated and analysed (809 complete and 136 partial responses) from stakeholders across 30 sectors and six primary target groups (see Figure 9). A total of 309 responses were excluded for failing to reach the partial response threshold or for containing 'blank data'. A detailed description of the survey design is available in Appendix D.2.1 Survey.

Figure 9 | Survey distribution of innovation system participants<sup>12</sup>



Source: Evaluation survey data

<sup>11</sup> Implementation and performance reporting data is cumulative, with program managers required to provide reports on a suite of measures, articulating the activities and achievements in the previous quarter(s). So while formal reporting did not commence until December 2016, it captures all activities and performance from the inception of AQ in July 2015. Refer Appendix A.3 for further information.

<sup>12</sup> Data from survey of AQ participants and recipients, co-designed by Nous and DTIS, administered by the Queensland Government and analysed by Nous.

More information on the data used to inform these findings can be found in Appendix D Detailed methodology.

### Terminology

Terms used in the field of innovation are not standardised and can be much contested. For example, 'innovators' can be used to refer to individuals who are attempting or have created new ideas or products in a variety of industries. At times, the term 'innovator' is used interchangeably with others such as 'startups', 'entrepreneurs', 'technologist' or 'futurist' causing further confusion.

In this report the terms 'innovator' and 'entrepreneur' are used distinctly. *Innovator* will be used to refer to entities undertaking the development of novel technology, processes or knowledge. While *entrepreneur* will refer to those creating solutions and opportunity (typically via commercialisation pathways). Often innovators are entrepreneurs, and vice versa, but not in all instances.

## 3.3 Key limitations

There are a number of factors that should be considered when interpreting the findings from this evaluation:

Administrative program data collected for monitoring and reporting of AQ presented challenges for the economic assessment. Most program data collected focused on selected key metrics which met the reporting requirements but did not cover the breadth needed for economic analysis (see Appendix A.3). To address this, other data sources were used and where no datasets were available appropriate assumptions were made. The Cost Benefit Analysis (CBA) had a number of assumptions due to these constraints. These assumptions increased the margin of error of the final CBA figure and for this reason the results should be interpreted as an estimation of costs and benefits. Limitations are further explored in section 4.5 (Efficiency: To what extent has the AQ initiative provided value for money?) of this report.

- International comparators have different reporting standards and classification methods for similar datasets. For example, while New Zealand uses ANZSCO and ANZSIC classifications, different microdata reporting requirements lead to an inability to match Queensland specific indicators. International comparators have only been included when this difference in reporting standards does not exist or where we have adjusted for it.
- International comparators are not shielded from the implications of federal funding policies. As Australian federal funding applies to all domestic comparators, deviations in performance are primarily due to state or local government actions. A similar issue is seen at an international level, where governments invest different amounts in innovation which will influence their performance.
- Definitional issues around what targeting the "knowledge" economy means in practice and for precise measurement of the intended sectors of the economy. Nous had to retrospectively develop a definition of the knowledge economy, whereas preferably this would have been done at the start of AQ.
- AQ programs by design contribute to more than one strategy and fulfil more than one AQ objective. This means that, when taking a strategy-specific view, some of the metrics will be double-counted across strategies. Conversely, the mapping of AQ programs to strategies is also incomplete – which therefore results in under-reporting of metrics (refer Appendix G).
- Due to lag times, some of AQ's impacts will have not yet been fully realised. To account for this, we have investigated leading indicators. However, these only provide a glimpse into what the longer-term implications of AQ may be. There may be future changes (both positive and negative) which are unanticipated and impossible to capture in this analysis.

- At time of analysis, about one-third of AQ's committed funding has not yet been expended (provided to recipients), which means the impacts measured in this evaluation are likely to change further as the remaining funding is distributed and subsequently spent.
- The focus of impact analysis (reach, effectiveness and efficiency) is on isolating the contributions of the AQ investment towards the state's knowledge economy. Attribution analysis, where a direct causal relationship can be established between the investment and change in the knowledge economy is not possible due to the following factors:
  - data gaps
  - COVID-19 impacts
  - complexity of the funding and context of Queensland cannot be fully controlled
  - intangible outcomes where the impact of AQ will be difficult to establish for many years.

### 3.4 Isolating economic impact

To isolate the economic impacts of AQ on the Queensland knowledge economy, three natural experiments (or counterfactuals) were performed using a range of economic metrics:

- Comparing the performance of Queensland with New South Wales, Victoria, Western Australia, South Australia and Australia over the period since AQ was launched and before COVID-19 impacted the most recent 18 months of data (the 'time period of interest').
- Comparing the performance of Queensland before and after AQ.
- Comparing the performance of Queensland AQ recipients with non-recipients from survey and ABS BLADE data.

It should be noted that a standard counterfactual, Queensland without AQ, is difficult to establish. Similar states within the Australian environment are used as a baseline and comparator for comparison. International comparator groups are also used to identify areas of success and improvement.

Isolating the impact of AQ is not easy due to the diffused nature of impact across the Queensland economy.<sup>13</sup> The effects of AQ cannot be easily distilled into a hypothetical baseline 'non-AQ Queensland'. There has also been many other Queensland and Commonwealth Government initiatives that will have influenced many of the macro-measures related to AQ. This evaluation has made use of the data available, and assumptions have had to be made at certain points. This means the findings on the economic impact cannot always be directly or fully attributed to AQ.

For more information on comparator groups please see the appendix D.1.2.

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<sup>13</sup> Department of Industry, Innovation and Science, 2019. Improving Innovation Indicators, consultation paper. Australian Government

# 4 Findings and Opportunities

## 4.1 Reach: To what extent has the AQ initiative been adopted by key stakeholders?

### KEY FINDINGS:

1. AQ reached all intended key stakeholder categories. Participation was highest amongst those identifying as startups and small and medium enterprises.
2. Participation from innovators and entrepreneurs in priority cohorts – female, Aboriginal and Torres Strait Islanders and those in regional and rural areas – was strong and increased over time.
3. Language enabled and inhibited reach. Where the terms innovation and entrepreneurialism didn't cut through, reframing as ingenuity and continuous improvement helped.

### Reach matters because it is the critical first step towards achieving objectives

This section presents findings on the extent to which AQ reached the intended stakeholders, as well as what helped or hindered this reach over time. This section will also report on the gaps in policy reach with reference to program design and appropriateness of mechanisms to reach the intended audiences and external factors such as the impact of COVID-19 on reach.

Understanding reach is a complex yet vital task, because if the funding and activities (program inputs and outputs) are not accessed by those they were designed to reach, it is difficult, if not impossible for the five overarching strategies to achieve their objectives. Engaging stakeholders early and across a project, and learning from them as program participants/recipients and through structured consultations supports effective reach.<sup>14</sup> Research suggests that where multiple and diverse stakeholders are present (such as innovation ecospheres and economic reform)<sup>15</sup> multiple layers or opportunities of engagement, meaningful input to support design, refinement and achievement of policy goals are created. This should include separate engagement activities for marginalised groups which provide safe spaces to explore and grow with like-minded people, as well as open-forums that enable different types of stakeholders to connect, learn and benefit.<sup>16</sup> In other words, effective reach and engagement with stakeholders is typically the first link in a well-designed program logic, and identifying any weak links can also pinpoint the causes of unexpected impacts (positive and negative), and what to do differently in the future to enhance positive impact.

### AQ reached key stakeholders and was highest amongst startups and SMEs

AQ reached many different types of stakeholders, representing the diversity of the innovation and entrepreneurship ecosystem. The key types of stakeholders include:

- startups, small and medium sized enterprises
- targeted cohorts:

<sup>14</sup> S. Ayuso, M-A Rodríguez, R. García-Castro, Miguel, Á.Ariño (2011) 'Does stakeholder engagement promote sustainable innovation orientation?' *Industrial Management & Data Systems*, Volume 111, Issue 9, pp. pp. 1399-1417;

<sup>15</sup> S.M. Riad Shams, D. Vrontis, R. Chaudhuri, G. Chavan and M. R. Czinkotae (2020) 'Stakeholder engagement for innovation management and entrepreneurial development: A meta-analysis' *Journal of Business Research*, Vol 119, pp 67.86.

<sup>16</sup> J. Cameron, D. Grant-Smith (2005) 'Building Citizens: Participatory Planning Practice and a Transformative Politics of Difference', *Urban Policy and Research*, Vol. 23 Issue 1, pp.21-36.

- Aboriginal and Torres Strait Islanders who are business owners, innovators, researchers and students
- female business owners, founders, innovators, researchers, future entrepreneurs
- people, companies and other entities in regional, rural and remote parts of Queensland (defined as beyond Greater Brisbane)
- current and future entrepreneurs and innovators, including school students.

While all key stakeholder groups were reached, penetration appears greatest among innovative small and medium enterprises (SMEs). Analysis of program data for all implementing agencies and survey data found strong uptake and engagement in SMEs and startups. For example, over three-quarters of AQ participants that responded to the evaluation survey identified as a startup, entrepreneur, business or company.<sup>17</sup> Following on from the Smart State, which placed emphasis on developing ‘bricks to brains to business’, the depth of reach with SMEs and startups demonstrate that the AQ initiative has achieved its broad intent of ‘developing Queensland as the “startup state”’.<sup>18</sup>

Despite extensive effort across the lifetime of the initiative to collect necessary data, there was inconsistency in the data collected across implementing agencies. For example, for large programs with many participants receiving grants (such as Ignite Ideas), details on the industry or industries was captured consistently and over time. However, some smaller and one-off programs and grants didn’t collect data on their recipients with the same consistency and granularity. Another example is level of granularity on applicants and participants in a way that is comparable across programs and agencies – are they a researcher from a large university, or an entrepreneur working in their shed, or the co-founder of a new small business, or a combination of these types? This has profound implications for visibility of industries reached at a macro level across the whole of AQ as well as at a program level.

The evaluation also investigated reach in relation to the eleven priority industries (advanced manufacturing; aerospace; agriculture and food; biofutures; biomedical; defence; hydrogen; mining equipment technology and services (METS); screen industry; resource recovery; and tourism). Findings are discussed in section 4.3 *Performance against strategic priorities*.

### **AQ’s reach was extensive and grew over the initiative’s life**

Between 2016 and 2021, AQ directly reached over 20,000 applicants,<sup>19</sup> 7,500 recipients, and a further 233,536 participants at 3,800 AQ supported events.<sup>20</sup> The cumulative number of applicants for AQ support increased over three-fold between 2016-2017 and 2020-2021 (Figure 10), indicating that awareness of AQ (and perceived value in the opportunities offered by the grants) grew.

Without a baseline of the size of Queensland’s innovation and entrepreneurship ecosystem (an accurate figure of the total number of small businesses and startups in Queensland in 2015 and in 2021 supported by public data), it is difficult to quantify how much the reach has increased since the inception of AQ in 2015-16. Within the relatively short duration of AQ implementation, the expansive reach is illustrated in the increase of applicants by over 250% between the period 2016-17 to 2020-21 (Figure 12).

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<sup>17</sup> The proportion of Queensland startups and SMEs reached by AQ and by the survey cannot be calculated because their total number in Queensland is not known. While the ABS’s BLADE data from 2018/19 has numbers of businesses broken down by state, by employee headcount and by sales, these figures do not align with the estimate of 452,200 small business (under 20 employees) in Queensland by Business Queensland. 555 survey respondents (50 percent) identified as being the owner or employee of a business, however, the size of the business was not captured. 305 respondents (28 percent) identified as a startup founder or employee.

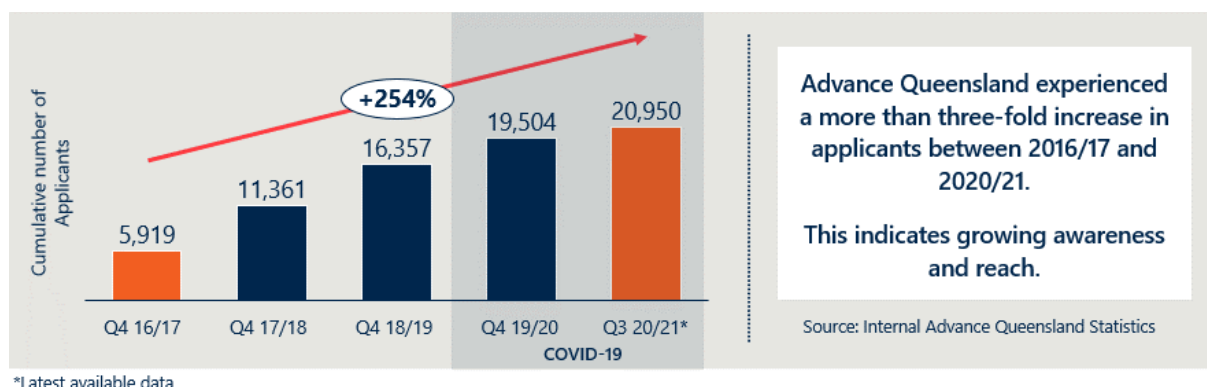
<sup>18</sup> Deloitte Access Economics, 2019. *The economic and imperative of innovation in Queensland*. Department of Innovation, Tourism Industry Development and the Commonwealth Games, Brisbane, p. 22.

<sup>19</sup> This includes grant applicants as well as those entering awards and competitions.

<sup>20</sup> Whole-of-initiative AQ Performance and Implementation data, supplied by DTIS, analysed by Nous Group.



Figure 10 | Cumulative number of AQ applicants



### Priority cohorts participated in strong proportions

The vision for AQ (Figure 6) emphasises that innovation improves quality of life as well as productivity.<sup>21</sup> In this way it is important for the initiative to promote inclusive innovation-driven growth. Three priority cohorts of participants were targeted in AQ – women, Aboriginal and Torres Strait Islanders and Queenslanders in regional and rural locations – and the evidence suggests reach was strong across all three cohorts. Success reaching these cohorts, who face and have faced more barriers and obstacles to participation in the economy, is significant and can be leveraged to target further under-represented groups in Queensland. This reach, and successful approaches used, is discussed later in this section.

Examination of program recipient data (summarised in Table 1) indicates that at least 39.49 percent of recipients were females, 3.60 percent were Aboriginal and Torres Strait Islander and 60.95 percent were from locations beyond Greater Brisbane. However, the overall number and proportion of females, Aboriginal and Torres Strait Islanders and regional and rural Queenslanders among AQ participants (in events and precincts) and recipients (of grants, fellowships and awards) is most likely under-reported in quarterly performance reporting by implementing agencies. The reason is that this data was only consistently collected across all AQ programs from 2019, which is too short a period to draw any conclusions on trends. Note the number of female recipients does not include female-founded businesses or female-led businesses, and only includes programs where individual female recipients are identified. This means that the number of female participants is likely under-reported, as a female-founded or led business could have additional women involved than those named in the application or reporting documentation.

Table 1 | The numbers and proportions of targeted cohorts among AQ recipients<sup>22</sup>

Targeted cohort	Grant recipients	Percent of AQ recipients*	Percent Queensland population
Females	2,985	39.49%	49.40%
Aboriginal and Torres Strait Islanders	272	3.60%	4.07%
Regional and Rural Queenslanders	4,607	60.95%	76.84%

<sup>21</sup> The vision for AQ is 'a state made for innovation – where ideas matter, collaboration takes us further faster, and local innovation spurs productivity, creates jobs and builds our quality of life'.

<sup>22</sup> Demographic data sources: female population of Queensland from the Australian Census 2016; Indigenous Australian population from the Aboriginal and Torres Strait Islander working population dataset; and regional population is calculated by total Queensland population minus Greater Brisbane population. See previous footnote on likely under-estimation of innovators from priority cohorts. The bracketed figure of the proportion of Aboriginal and Torres Strait Islander Australian participants is from program lead closer to the recipients and represents the potential upper level provided by the program lead.

Despite the limitations of the data, it is clear that efforts at the program and initiative level have led to proportions of recipients from targeted cohorts at, or approaching, their proportion of the Queensland population (see Table 1 above). These proportions are much higher than is typically present in knowledge economy jobs, since these demographic groups tend to be under-represented in the knowledge economy.<sup>23</sup> For example, the proportion of female-led startups who benefited from AQ support surveyed in this evaluation is 38 percent. This compares to results of survey by StartUpAus which found four percent of Australian startups have an all-female founding team and 15 per cent have at least one female founder.<sup>24</sup>

It is also important to unpack the proportion and quantum of funding received by regional recipients. As indicated in Table 1 above, 60.95 percent of the 7,500 recipients of AQ grants, competitions and other opportunities were located regionally. However, their proportion of total funds provided to these regional recipients – 11 percent, is significantly lower, primarily due to the nature of the programs accessed by regional participants. For example, 3,600 (78 percent) of regional recipients were through the portfolio of programs under the DESBT Advancing Small Business Strategy which provided an average of \$3,325 per recipient, and 1,685 (36 percent) received services provided by the Mentoring for Growth Program, which provided support but no funds.<sup>25</sup>

Less than 40 regional recipients received over \$1 million in funding, compared to over 80 recipients in Brisbane/statewide, reflecting the profile of the state economy. For example, in AgTech, BioFuture, Connecting with Asia, Innovation Partnership Grants, Queensland hydrogen industry development, and in research infrastructure and hubs (discussed further below).

Further understanding of reach is gained using a geographic (place and location) perspective. This is illustrated in Figure 11, below, which shows the distribution of AQ recipients, and distribution of AQ survey respondents across the state of Queensland and beyond the state's borders. This figure shows that all Queensland regions had participants and beneficiaries. It also shows proportions of recipients (obtained through analysis of program data) and of evaluation survey respondents broadly align. (Survey was created by Nous for this evaluation and distributed by the Queensland Government). This is important because it shows that the survey – much like AQ – reached participants in all Queensland's regions, with similar breakdown to program data. Data derived from those two sources reinforces the fact that the bulk of the population and economic activity is in the southeast of the state, and that Outback Queensland has the least population and economic activity of all regions. AQ recipients and survey respondents mirror these proportions.

This figure also reinforces the idea, raised independently by participants in focus groups and interviews, of the Sunshine Coast's growing prominence as an innovation region and a potential "Australian Silicon Valley"- possessing enough proximity (and distance) from a major city, research institutes, and high-tech industry, with the added bonus of a superior climate. This figure was created using the best available data from the program database which records information about recipient by the Regional Action Plan (RAP) region categories as defined by Queensland Treasury. These data gaps also signal an opportunity to improve data collection and reporting across implementing agencies to further support evaluations and decisions on program effectiveness.

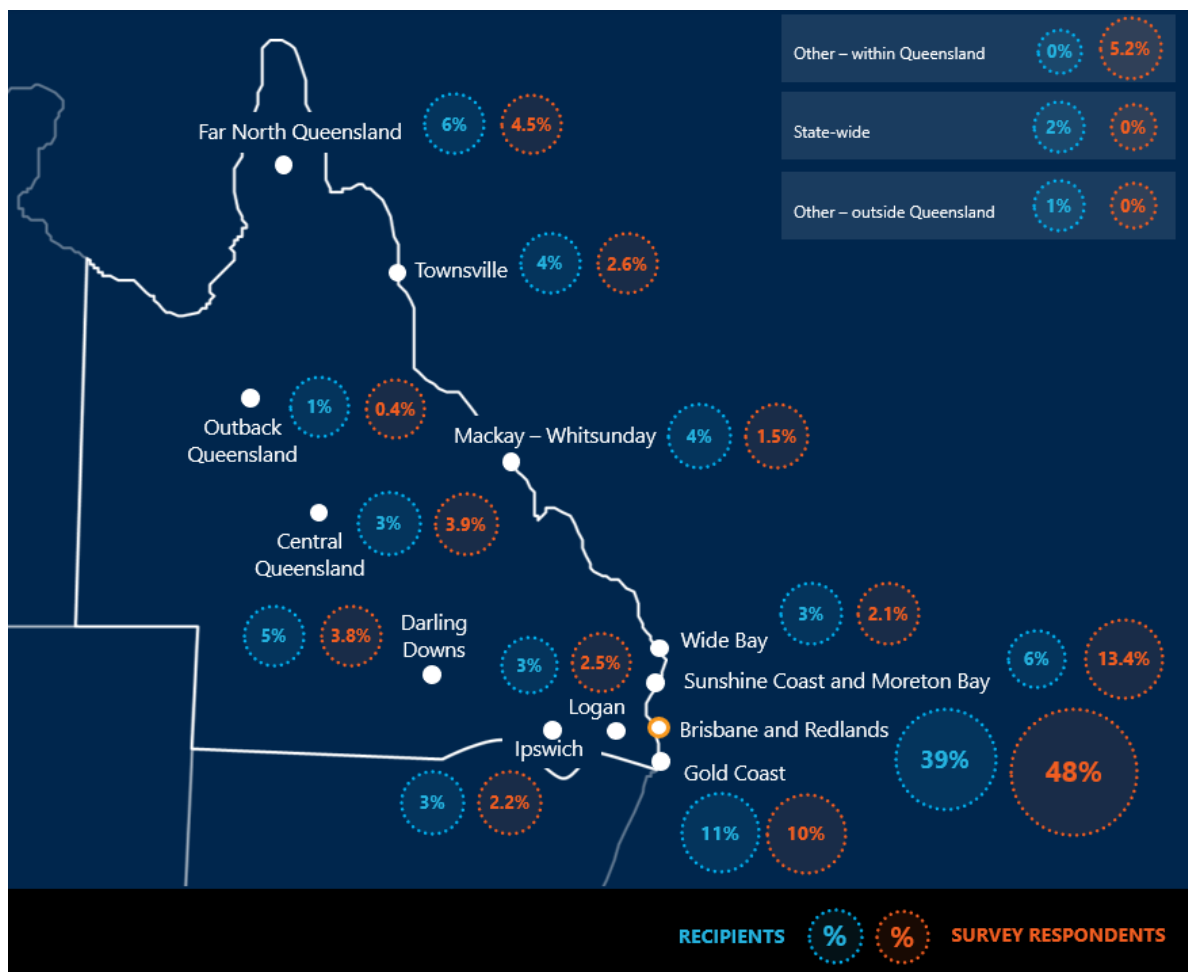
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<sup>23</sup> Based on examination of available data for a cross section of knowledge economy jobs as listed in Appendix C.1

<sup>24</sup> StartUpAUS *Crossroads report 2017*, available online at <https://startupaus.org/document/crossroads-2017/>. The sample drawn from the survey is Australia wide.

<sup>25</sup> Some recipients received more than one grant and/or participated in multiple programs.

Figure 11 | The geographic distribution of AQ recipients and participants across Queensland's regions<sup>26</sup>



The numbers in the top right show the proportion of AQ recipients (blue) and survey respondents (orange) that were not based in one region alone, for example, they spanned two regions, the whole state or were based outside of Queensland.

### The strong participation rates of priority cohorts indicate appropriate design at both program and initiative levels.

Queenslanders belonging to the priority cohorts, innovators that identify as women, Aboriginal and Torres Strait Islanders, and/or live in regional areas, had access to targeted programs. These programs sought to overcome historic and structural obstacles through program design that responded to specific needs faced by their cohort, such as fewer female mentors, or lower rates of higher education, and greater difficulties accessing capital, talent or other resources. For example, the Deadly Deals program – under the Deadly Innovation Strategy introduced in 2018 – was only available to Queensland startups and “scale-ups” that are Indigenous enterprises, and which were unsuccessful or ineligible for other financial grants. Recipients of Deadly Deals went on to become some of the most striking success stories of AQ receiving the capital, connections and cultural safety to overcome initial barriers. (See case study on page 77). Similarly, the Women’s Assistance Research Program (WRAP), the Female Founders Program, and the Advancing Regional Innovation Program all took the historical and contemporary challenges into account and sought to remove or lessen these. An earlier rapid review of regional programs and the Female

<sup>26</sup> Regional Action Plan from AQ dashboard as at 31 March 2021 (cumulative from 2016-17- 2020-21). This dataset (for which data was richest) includes 101 programs and partnerships. This data includes two categories – allocated and contracted – and these do not align with other AQ datasets, reflecting the fact that 39 programs are not included. Data analysed by Nous.

Founders Program found they were highly valued by participants and broadly achieved their objectives, indicating appropriate program design, management and implementation.<sup>27</sup>



“Juggling a business alongside the additional family responsibilities can be difficult. There are also some issues with connecting or working with some men, especially those that don’t have kids. The connections made in this program helped me navigate and overcome these.”

– *Female innovator that participated in Spark Female Founders Program*

“[The coaching and networking] meant I was able to build a number of connections with AQ, trade investment and overseas. This helped me get venture capital, which had been the hardest part.”

– *Female innovator that participated in Spark Female Founders Program*

“The capital, knowledge and connections really got our business going”

– *Female entrepreneur that participated in Female Founders and Deadly Deals*

Successful reach of these targeted programs for priority cohorts is in large part attributable to the knowledge, networks and responsiveness of program leads. These individuals facilitated the progress of activities and connected Aboriginal and Torres Strait Islander enterprises and innovators with experts to help with business development and management. For example, an Aboriginal and Torres Strait Islander business recipient was connected with an Aboriginal and Torres Strait Islander law firm specialising in intellectual property for artworks used for branding. It was reported that these efforts by the Deadly Innovation Strategy team have been appreciated, there are more opportunities for deeper engagement with Aboriginal and Torres Strait Islander innovators and businesses across the innovation eco-system. The precursor to this is more opportunities for meaningful connection in which trust can be established and grown. In other words, the approach and mode of delivery used by the Deadly Innovation team was effective and could be scaled up and applied to other priority cohorts.

For more information on the appropriate design of programs for innovators and entrepreneurs that are women, Aboriginal or Torres Strait Islanders, please see the case studies on pages 90 - 94.

Recognition of importance and resulting participation of these priority cohorts is reflected in the proportion of funding allocated to targeted programs for these groups, which grew by four percent (relative to the total budget) between 2017 and 2021, resulting in an additional \$29 million dollars for these dedicated programs.



“Navigating government and business sectors to find the right people or opportunities is a minefield! The connections made [through Deadly Deals program and leader] were invaluable.”

– *Indigenous entrepreneur/business owner*

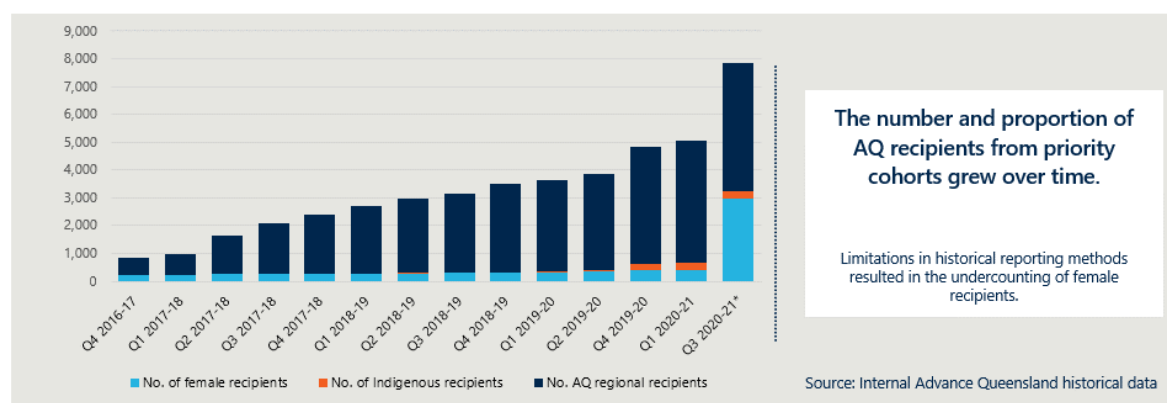
“The connections [Program lead] helped us market to the right people and organisations to partner with, and the funding to engage them were hugely significant. Without it, would have been a lot less successful. The connections really helped us build our capabilities and capacity to scale and take our products further”

– *Indigenous entrepreneur/business leader*

<sup>27</sup> *Advance Queensland Innovation Partnerships: Final Rapid Review Report*, Prepared by Nous Group for the Department of Tourism, Innovation and Sport, 18 October 2021; *Female Founders: States of Change (Update to ILT)*, Department of Tourism Innovation and Sport, 18 November 2021; M. J de Villiers Scheepers, S De Klerk, L. Daniel, P. Jenner, N. Tracey, C. Renado and M-K Verreyne, *Queensland Regional Innovation Benchmark Research Report 2021*, University of the Sunshine Coast, 2021.

Strong participation numbers and rates among these priority cohorts is also due to the deliberately inclusive design of ‘mainstream’ programs. Indeed, many more female, Aboriginal and Torres Strait Islander and regionally-based Queenslanders participated through programs open to innovators and entrepreneurs of all backgrounds and locations, such as small business grants and regional hubs. This tells us that ‘mainstream’ AQ programs also attract innovators and entrepreneurs from these priority cohorts, thereby increasing reach (see Figure 12). This suggests that program design and roll-out was inclusive.

**Figure 12 | Increase in the number of recipients from priority cohorts**



Some recipients may fall under multiple priority cohorts

Increasing rates of participation in ‘mainstream’ AQ programs also suggests that program improvements over time have been effective in increasing reach to priority cohorts. Many of these refinements to program design and implementation were made in response to recommendations of the first macro evaluation, program evaluations and reviews. For example, 2019 internal program analysis and external evaluations revealed priority cohorts were under-represented in Ignite Ideas due to an assessment system that advantaged professionally written grant applications at the expense of some more promising applications from individuals and enterprises that could not afford to hire a professional grant writer.<sup>28</sup> The revised assessment system considered structural obstacles faced by these priority cohorts which had been underrepresented through an allowance of additional points, so more promising projects were considered and competitively assessed on merit of the idea rather than prose of the application. This shows that while it is important to respond to structural barriers facing these priority groups with dedicated programs that seek to mediate or overcome these barriers, it is equally important to support these groups to access opportunities generated through ‘mainstream’ programs which connect them with a broader network beyond just their demographic group.

### **Innovation infrastructure enabled reach and supported achievement of AQ strategies**

Innovation enabled reach and thus supported AQ’s implementation and strategies in different ways. This was true both of hard (physical or built) infrastructure, which is typically place-based, and soft infrastructure.

Hard infrastructure, such as innovation hubs, and research or technology centres, were increasingly directed to regional areas. These were sometimes co-located with universities to leverage and expand existing innovative R&D underway, and attract more innovators (researchers, industry, investors and businesses) to that region. These pieces of innovation infrastructure also offer programs and activities targeted at capability building of the local innovation ecosystem including SMEs, startups and aspirant entrepreneurs, through events, training, networking opportunities, and provision of working spaces, specialist equipment or onsite expertise.

<sup>28</sup> Focus groups with program participants and government administrators

The AQ-funded QCN Fibre and Cybernode projects is another example of growing reach through infrastructure that spans both the hard and soft categories. Three hubs (Cyber Security Innovation Nodes) are being established in Brisbane, Townsville and the Sunshine Coast supported by Queensland, Commonwealth and local governments. While these are parts of physical infrastructure, the security provided by these nodes is expected to grow the use and trust in digital technologies used to conduct business and events.<sup>29</sup>

Reach is expected to further grow as new physical infrastructure supporting innovation is completed or expanded, opening further opportunities to individuals, businesses, organisations and industries across Queensland. The \$25 million Research Infrastructure and Co-Investment Fund is expected to support this extension to innovation infrastructure across the state.

Physical infrastructure funding was distributed across Queensland’s regions, with the largest share concentrated in Greater Brisbane where the population, as well as the number of startups, industries and research institutes was greatest (Table 2). Also, it is important to note that some state-wide innovation services and infrastructure, such as the Precinct, are designed to serve regional as in addition to metro locations and based in Brisbane.

**Table 2 | AQ physical infrastructure: what has been spent as at 31 March 2021**

AQ physical infrastructure	Budgeted	Expended	Percent Expended
The Precinct (Brisbane, serving the state)	\$18,828,000	\$10,842,081	58%
Artificial Intelligence Hub (Brisbane)	\$5,000,000	\$1,972,227	40%
JCU Ideas Lab	\$10,000,000	\$10,000,000	100%
Advanced Technology and Innovation Centre (CQU in Rockhampton)	\$2,800,000	\$2,780,000	99%
Agtech and Logistics Hub (Toowoomba)	\$3,000,000	\$50,000	1.6%

Source: AQ program data analysed by Nous

Soft infrastructure such as digital capabilities and the services that underpin the hard economic, technological and social institutions, are also vital and bolstered by the programs and presence of hard infrastructure outlined above.

### **Reach was enabled through local connections, targeted and meaningful engagement, suggesting the delivery mechanisms used were broadly effective**

Local characteristics and dynamism can influence the extent of policy and program reach. Research on innovation ecosystems and regional innovation do not concur on the optimal combination of factors to create effective reach or local connections. However, there seems to be some agreement that local influences place an important role in enabling or inhibiting program reach and effectiveness.<sup>30</sup> Strong application, participation and attendance by key stakeholders helped to grow local and statewide innovation ecosystem and their leaders. These leaders could then manage grant funding and programs, share ideas with each other, and use their networks, local knowledge and existing services, businesses or facilities to extend reach, by designing events and programs specific to the needs of their region or cohort, and in language that “cut through”.<sup>31</sup> Multiple focus group participants and interviewees reported this led

<sup>29</sup> ‘AustCyber Nodes Strengthen Qld Cyber Economy’, <https://www.austcyber.com/news-events/austcyber-nodes-strengthen-qld-cyber-economy>

<sup>30</sup> Summary of analysis across the following literature sources Renando. C, 2021, Regional innovation literature (thesis draft). Queensland University of Technology, Brisbane, unpublished. Brown. R and Mason. C, 2017. Looking inside the spiky bits: a critical review and conceptualisation of entrepreneurial ecosystems. Small Business Economics Journal. Pp. 11-30. Hanley-Brown, Kania. J and Kramer. M, 2012. Channelling change: Making collective impact work. Stanford Social Innovation Review.


<sup>31</sup> Interview with IAC members, Deadly Innovation program leader, participants in the focus group for regional and rural innovators and entrepreneurs, participants in the focus group for indigenous innovators and entrepreneurs.

to a snowball effect, with those individuals sharing information forwards to other current and potential AQ participants.<sup>32</sup>

One prominent example of a collaborative, inter-sectoral mechanism established in July 2021 by the Queensland Government is the Innovation Advisory Council (IAC). Four IAC members have been appointed for two-years from a range of backgrounds including venture capital, research commercialisation, research-industry collaborations, tech innovations, the design of successful innovation hubs, and entrepreneurship in small business. It was reported in interviews and focus groups with IAC members that they are leveraging their knowledge and networks to proactively seek out and connect current and potential AQ participants with people and opportunities that could help progress their venture.

Conversely, reach (and resulting impact) was limited when programs were run or administered by providers that did not fully understand their context, approach, drivers or opportunities of intended recipients. For example, it was reported that a program for emerging female entrepreneurs did not resonate with the target audience due to being designed and run by a male facilitator who took a deficit-based approach that neither recognised gendered barriers nor the ingenuity exercised by female entrepreneurs in navigating and overcoming these barriers. Similarly, we heard from participants in focus groups for regional innovators that the Advance Regional Innovation Program (ARIP) was limited in its success due to the installation of third-parties as intermediaries between AQ program leaders and local innovation ecosystem stakeholders. Some local innovation leaders attributed this to program design due to a lack of confidence among Brisbane-based program leaders that the regional innovation sectors could manage the governance and acquittal of the fundings. Local leaders, ARIP program leaders and recipients resented what was seen as an artificial and cumbersome governance approach that made it difficult for local leaders, companies and innovators to work effectively towards program goals.<sup>33</sup>

It is also possible that these views come from one of the 12 ARIP projects which had large consortium memberships. This means that while an important finding, they may not be generalisable. However, these two examples reinforce the importance of aligning program intent, providers and administrators, and taking into account of local (place and specific cohort) in the program and grant design stage and mode of delivery.



“Being the CEO of the Lead Applicant Organisation for one of the first ARIP funding tranches we became the point of angst and anger from the Innovation Sector as they contended AQ promised and committed to funding startup groups and co-working spaces directly to invest in the Innovation Ecosystem. They resented the intermediary role of the lead applicant installed by AQ and in some cases actively undermined or disengaged with the process. The governance overlay from AQ and the angst from the innovation ecosystem participants became so problematic at one stage we started negotiations with AQ to hand back the ARIP funding and terminate the arrangement. It just wasn’t worth the trouble and wasn’t delivering outcomes.”

– *Regional innovator and leader*

<sup>32</sup> Interview with IAC members

<sup>33</sup> Department of Innovation, Tourism Industry Development, 2021, *Rapid Review of Advance Queensland Regional Innovation Programs*. Brisbane, Australia

## **Engagement mechanisms were broadly effective in achieving reach to priority cohorts, and there are opportunities for improvement and sustainment**

A broad array of delivery modes were used to bring AQ to Queensland's regional and remote locations and this combination appears to have been broadly effective but not self-sustaining – ongoing funding support is necessary. These modes of delivery included direct engagement through grants (particularly ARIP), events such as the regional roadshows and Flying Scientists programs, infrastructure investments, visits to, and from, innovators and entrepreneurs from elsewhere in Queensland, Australia and the world through Hot DesQ and Startup Catalyst. These are discussed in turn.

Direct engagement through the activities and programs run through the Office of the Queensland Chief Entrepreneur and the Office of the Queensland Chief Scientist provided a tangible “hook” to AQ and increased the understanding and valuing of STEM and innovation as part of the Supporting Culture strategy. One illustrative example is the Flying Scientists program, which flew scientists from across Australia to rural and remote locations to visit schools and communities and run activities. We heard from program leads and teachers that these opportunities were the only occasion in which “everyday” Queenslanders could connect and learn about science and innovation in action. Adults and children would drive for a day or more to see, touch and ask questions of the visitors.

The ideas and connections made prompted them to do things differently, seek to prototype new systems or products to solve a problem, or planting the seeds of the idea to pursue a career in STEM through a deeper understanding of what such careers could involve. Conversely, the absence of such direct engagements and connecting of ideas with people solving tangible problems through innovative thinking and STEM skills has been attributed to lack of interest or awareness of these careers.

These engagement mechanisms were most successful when they were interactive (with engagement going in multiple directions) rather than passive and one-way. Almost all participants in AQ from regional areas stated they appreciated the aspiration and visibility of the Chief Entrepreneur and regional roadshows, but that these often felt like a “talk fest” in which “empty promises” were made. The lack of follow-up or deep engagement made some question the value of hosting or participating in these events. This suggests the model of the Office of the Chief Entrepreneur is misunderstood by some as an arm of government, which in turn points to the need to clearer communication and branding of this Office and its functions.

The question now is how to sustain and enhance these programs. The Office of the Chief Scientist, Chief Entrepreneur and their participating departments are exploring options, including looking at regional councils and networks. Potential solutions are proposed in Section 5 on Opportunities.

Infrastructure and the industry and research partnerships was another mode of engaging with targeted cohorts, especially regional and remote Queenslanders. We found evidence of direct and positive impact of large infrastructure in regions for research (TropIQ), and industry (biotech) and through partnerships (academic with a council resulting in historical fundings and tourism centres and master plan) with anticipated sustained positive impact through ongoing jobs and revenue attraction. Infrastructure provided a physical place to connect and work and develop capabilities, especially for advanced research/industry and for startups. What happens inside is equally important: networking, engaging events and programs, specific research collaborations. While these might not happen without the building, the building doesn't guarantee collaboration.

While digital tools allowed for additional remote conversations and collaboration – such as online events – we heard that “nothing equals face-to-face” for innovation collaboration. Although there has been a big push for digitisation, physical spaces and infrastructure will always be needed, particularly for niche and non-tech industries.

Anecdotally, building and growing extensive research and innovation infrastructure that supported reach to these stakeholders and also attracted or developed more researchers, talent, entrepreneurs etc. Note that some stakeholders suggested that this infrastructure wasn't always utilised fully or effectively.



Better use of client management systems, local networks and marketing is required to fully realise and sustain the benefits of built infrastructure. This could take the form of creating, combining and updating event and contact e-lists, co-hosting events, and enticements (such as membership to a hub) to participant in events or training. (See infrastructure case study for further descriptive analysis of the role of infrastructure in metro and regional location, and key takeaways).

Co-location requirements hindered reach and collaboration as much as they helped. We heard flexibility was required to make these attractive and practical to all industries, as it worked better for some industries (agriculture, mining) than others. This flexibility could mean part-time physical co-location, supplemented by digital connections in order for industries based in South East Queensland to partner with regional universities.

**Figure 13 | Insights from the focus group for regional and rural innovators and entrepreneurs**



“One of the best things AQ did was bring us together and create a community of community leaders in the State. Whether it was supporting Catalyst or a couple of days in Brisbane, it gave us time to step out of our spaces and come together, share ideas, make a network and breathe. That was incredibly valuable and helped me personally to feel confident that what I was doing was valuable and also for me to improve my offering.”

– Regional focus group participant #1

“Innovators and entrepreneurs don’t necessarily connect with that language, perceiving it as trendy, techy, or inventions. They see themselves as “problem solvers” and “small businesses”. They don’t recognise that innovation is often driven by Mum and Dad businesses in regional Queensland. Therefore they are not necessarily connected into “innovation” conversations and opportunities... We are working to normalise innovation, need to make it business as usual.”

– Regional focus group participant #2

### The language of innovation didn’t always cut-through in regional areas, inhibiting reach

Many businesses based in regional and rural Queensland associate innovation with technology, ‘city-folk’, and ‘trendiness’. This perception was reinforced by some of the websites and brochures promoting AQ, which several regional leaders and business owners, and some IAC members, felt had limited reach. These regional leaders reported that when they reframed innovation as Queensland ingenuity or continuous improvement, it gained more traction, heightening both understanding and valuing of the concept of AQ. This tells us that the reach is influenced by language, and that to maximise reach and engagement, it is important for government and industry’s messages on innovation to be delivered in a way that is understood and positive.

### There is a case for adding other cohorts facing barriers to priorities

Evaluation found positive outcomes in reaching groups defined as priority groups – female, regional and Aboriginal and Torres Strait Islander innovators. However, these are not the only demographic groups facing barriers to innovation.

People with disabilities, people from culturally and linguistically diverse backgrounds, and from very low socio-economic backgrounds – such as prolonged or multigenerational unemployment – face significant additional barriers to participating in the labour force, and especially in highly-skilled jobs such as those in the knowledge economy. Given the historic and ongoing challenges they faced, and alignment with Queensland’s broader priorities for a more inclusive state and economy, targeted efforts to reach people from these cohorts is warranted.<sup>34</sup>

<sup>34</sup> Australian Institute for Health and Welfare, *People with a disability in Australia:2020*, 2020. Available online at [www.aihw.gov.au](http://www.aihw.gov.au); Wanelik, K et al, ‘Breaking Barriers? Ethnicity and socioeconomic background impact on early career progression in the fields of ecology

## COVID-19 influenced program delivery and access, with both positive and negative impacts on reach observed

The COVID-19 pandemic and resulting safety measures, border closures and economic downturn affected different AQ programs – and thus reach – in different ways. Some grants and programs were paused until they could be undertaken as intended for maximum return on investment, such as Indigenous Industry Business Cases which was part of the Deadly Innovation Strategy.

Other programs did not run at all, or were done on much smaller scale, or delayed such as those in the tourism industry, or R&D requiring highly specialist equipment and technical experts to install or maintain them, and, specialists who were prevented from entering for some time due to border closures; this all resulted in significant negative impacts.

However, COVID-19 also demonstrated that some work could be done remotely, and prompted government, businesses and not-for-profits to be more innovative in how they worked. This is evidenced by an increased use of digital technologies which enabled greater connectivity with customers and innovation networks both in Queensland and globally. It also saw a pivot to online events which posed fewer access barriers for small businesses and entrepreneurs that would not have had the time or resources to travel and attend in-person events.

This meant that reach, although extended, was potentially less engaging. In some cases, the facilitators tailored these events to local attendees by having local speakers and participants, ensuring the discussion and connections were more relevant. Other local hub leaders spoke of being able to host international speakers remotely, which otherwise they may not have done. Limited connectivity may have limited the ability of those in regional and rural areas to join or fully engage with online events.

COVID-19 accelerated the adoption of innovation as businesses had to become agile to deal with new situations. Notable and recurrent examples of this adoption or increase of agility included:

- Local businesses and industries seeking new, alternate products and partners due to broken or delayed supply chains, which led to a ripple effect, with further local enterprises benefiting from a supply chain that had more state and local suppliers.
- Telehealth and research institutes commenced or increased their use of digital rather than paper-based forms of delivery, service delivery, collaboration, communication and record keeping. Innovative businesses in the digital recordkeeping and systems space experienced a boom in business. (See case study on Deadly Deals).
- Greater use of video-conferencing software for internal business management, including engaging with staff or business partners, advisers and suppliers

In summary, the impact of COVID-19 on AQ's reach is still being felt and understood. The outcomes of the variations to inputs (programs and funding) and outputs (activities) are still unfolding and may not be distinct for years to come given extent to which they were influenced by, and tangled up in, greater economic events. This means that benefits they may have been concentrating on in 2020-21 may be spread over a longer period from 2021 into the future.

### Conclusion

AQ increased its reach of intended stakeholders by more than three-fold between 2016-17 to 2020-21. The reach at the firm level was achieved by attracting and supporting SMEs and startups in Queensland.

AQ programs, on the whole achieved inclusive reach as illustrated the expanding participation of females, Aboriginal and Torres Strait Islander and regional stakeholders. Both targeted and mainstream programs and activities are critical for increasing inclusion. There is an opportunity to scale up modes of delivery to

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and evolution', *Ecology and Evolution*, 10 (4), pp.6870-6880; Mallett, S. Brotherhood of St Laurence Submission to the Inquiry on International Welfare Dependence, BSL, 2018; AIHW, Employment and under-employment , 16 December 2021; Federation of Ethnic Communities of Australia, Productivity and growth through diversity: multiculturalism must move to the core of all government policy, FECCA, 2016.

further expand inclusion of stakeholders who are not currently targeted. The approaches used by the Deadly Innovation team appear particularly successful and are worth expanding to other cohorts and programs.

The impact of COVID-19 on AQ’s reach was, and continues to be, mixed. While online events enabled more people to connect, the need for in-person connections remains, especially for more complex collaborations and the building of trust.

Opportunities to maximise reach are detailed below and include improved and more systematic data gathering and reporting across implementing agencies on demographic and geographic metrics; and greater use of local leaders and networks, language that is readily understood and embraced by all key stakeholder groups.

**Table 3 | Opportunities to maximise reach**

Opportunity	Supporting findings and details
<p>1. <b>The reach of AQ can be increased by leveraging local and industry leaders, networks and regional strengths.</b></p>	<p>The evaluation found that identifying, connecting and trusting local leaders in state-wide and local innovation eco-systems can lead to better outcomes, as they are supported by designing, facilitating and promoting events and programs specific to the needs of their region or cohort, and in language that “cut through”. These local leaders were reinforced by the Office of the Chief Entrepreneur, the Office of the Chief Scientist and more recently, the members of the IAC, who brought additional visibility, credibility and networks in innovation, business and research spheres. (While this is happening, effectiveness and consistency was observed and reported to vary across the state).</p> <p>There is an opportunity to expand on this by consistently partnering with leaders of local government, local innovation hubs and technological infrastructure, chambers of commerce and industry to develop and promote AQ grants and collaboration opportunities due to their deeper local knowledge and connections.</p>
<p>2. <b>Hybrid (online and in-person) engagement is valuable and could be continued and enhanced.</b></p>	<p>Hybrid approach to delivery of engagements (including events and coaching) networking and capability building has been well received by AQ participants from priority groups, particularly female entrepreneurs and those in regional areas.</p> <p>While in-person events appear to support deeper human interactions and the trust that is a precursor to sustained collaboration, online delivery increases accessibility and can serve well to grow networks, and for periods between in-person catch-ups or events which are necessary to maintain momentum on collaborative research/ventures between one or more innovators.</p> <p>Now that hybrid events have been tried and tested as part of the COVID-19 response, they should become part of business as usual and continually refined to maximise reach and value. This necessitates the use of hard infrastructure (such as QCN fibre) and soft infrastructure (such as digital capabilities) to ensure effective participation and access. On this, the Queensland Government could continue to leverage or build upon joint funding arrangements, such as with the Commonwealth and industry, for example through the \$25 million Research Infrastructure Co-investment Fund.</p>

Opportunity	Supporting findings and details
<p>3. <b>Expand reach by building on effective approaches to engaging Aboriginal and Torres Strait Islander, female, and regional innovators to all key stakeholders, including, potentially, those from other groups that face structural barriers to their participation in the knowledge economy</b></p>	<p>AQ has delivered positive outcomes for three priority groups (see section 4.1 Reach for more details) – Aboriginal and Torres Strait Islander, female and regional innovators.</p> <p>An opportunity exists to expand the definition of priority groups by adding other demographic groups that similarly face significant barriers to participation in the innovation ecosystem and knowledge economy, such as people with a disability, people from culturally and linguistically diverse (CALD) backgrounds, and people with very low socio-economic backgrounds. The decision whether or not to expand the number of priority groups should be based on a detailed examination of the needs and barriers faced, along with estimate on return on investment in new programs. The Deadly Deals program is one example of strong outcomes for government and participants.</p>
<p>4. <b>Use language that is positive and readily understood by the target audiences</b></p>	<p>Evidence from focus groups and the survey found the word ‘innovation’ was unclear to many key stakeholder groups, particularly in regional areas. The evaluation found the term was misunderstood (for example as relating only to high-tech inventions), ambiguous, or even worse pejorative – associated with “trendy urbanites”.</p> <p>To extend reach, the language of AQ programs and externally facing communications should adapt to encompass words and concepts that are readily understood such as ‘problem-solving’, ‘ingenuity’, preparing for the uncertain future, investing in science and technology, and leveraging R&amp;D.</p>

## 4.2 Effectiveness: To what extent has the AQ initiative delivered on stated objectives?

### KEY FINDINGS:

1. AQ grew community understanding of innovation and entrepreneurialism, and enhanced Queensland's domestic and international reputation as a place to work and do business.
2. Foundational innovation capabilities, such as STEM skills or use of innovative technologies, have been developed at a slower rate in Queensland than in other comparator states.
3. AQ facilitated a wide range of strong collaboration outcomes for its participants, ranging from confidence-boosting connections to formal business partnerships resulting in increased profit and job creation.
4. Despite slower growth in venture capital market than in other states, Queensland businesses and State and Federal government demonstrated healthy investment in R&D.
5. AQ has delivered strongly on the objective of scaling for jobs and growth, with rising labour productivity, knowledge jobs and an increase in the number of scale ups.
6. AQ supported the growth of Queensland's knowledge economy and helped prevent industry's' further concentration in the mining sector. Together, this contributed to greater stability.

### Introduction and context

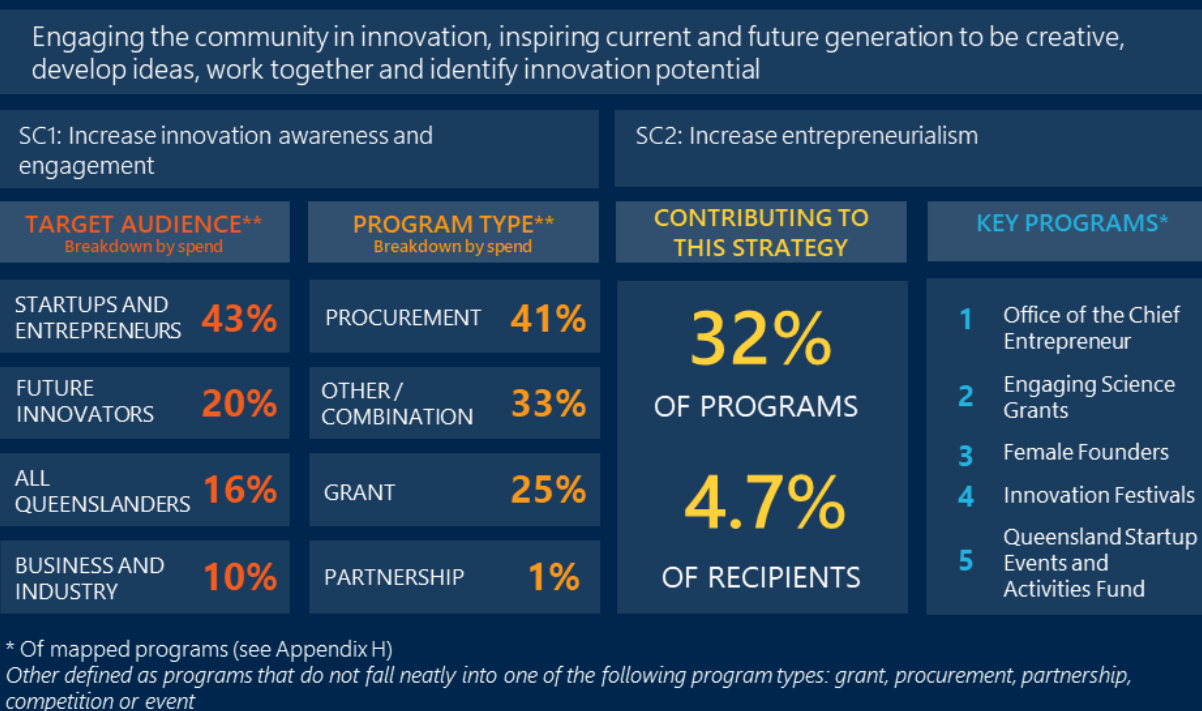
This section provides an analysis of the net outcomes from the initiative in relation to the AQ strategic objectives and priorities, and the investment's effectiveness in terms of contributing to changes and trends at the state level.

All AQ programs contribute to one or more the of the five AQ strategies outlined in the AQ policy and evaluation framework. Only 69 priority programs were formally mapped against these strategies in 2019. Therefore, while the analysis covers the impacts of all programs, taken at a system-wide level, the summary boxes at the start of each sub-section only provide statistical summary on the 69 priority programs and excludes key programs introduced from 2020. (See Appendix H for further information and definitions of priority programs).

In addition, these 69 priority programs were also mapped to program type – grant, procurement, partnership, competition or event. In cases where programs did not neatly fall into one of these categories, they have been classified as "Other/Combination".

We acknowledge that each of these areas has numerous factors that influence their trajectory. Individually examining what is going on outside of AQ is largely out of scope for this piece, although it is acknowledged where appropriate. For each area, further research and investigation could be done to figure out everything else that is going on and how AQ complements that. Due to these external factors, it is near impossible to fully attribute all benefits to AQ in some pieces of analysis. Regardless, the analysis shows key trends that AQ has surely contributed towards.

## 4.2.1 Supporting culture



### Initially AQ raised the “profile” of innovation, entrepreneurship and science in Queensland, but this may have not been sustained

A repeated theme in stakeholder engagement has been the value of AQ’s contribution in raising the profile and understanding of innovation and entrepreneurialism. This theme was strongly present across all regions, priority groups and sectors that participated in focus groups, interviews and the survey. In particular, establishment of the Office of the Queensland Chief Entrepreneur (OQCE) was reported to give visibility and legitimacy to entrepreneurship. Very different entrepreneurs who have occupied that office gave Queenslanders’ insight into the different forms innovation and entrepreneurship can take, and that these differences are valued.

This greater understanding and deeper valuing of innovation has been confirmed through two surveys of broad cross-section of Queenslanders’ Perceptions and Attitudes to Science and Queenslanders’ Perceptions and Attitudes to Innovation.<sup>35</sup> They found the majority of the population is now showing a strong positive attitude towards science and innovation. Particularly they found that in 2021 74 per cent (up from 72 per cent in 2016) of Queenslanders believed that innovation has strong positive impact on themselves and the state, and similarly in 2017, 79 percent of respondents believe that science has positive impact on society.

However, those surveys found there is small but consistent trend of negative perceptions of science – for example a percentage of Queenslanders who would discourage their children from studying science subjects in schools grew from 1 per cent in 2016 to 4 per cent in 2021. This trend is consistent with a global phenomenon of growing mistrust in science, evidenced by rejection or antipathy to scientific evidence on climate change or vaccines.<sup>36 37</sup>

<sup>35</sup> Colmar Brunton. 2017. ‘Queenslanders’ Perceptions and Attitudes to Innovation’ and Kantar Public. 2021. ‘Queenslanders’ Perceptions and Attitudes to Science’

<sup>36</sup> Nasr, N. 2021. ‘Overcoming the discourse of science mistrust: how science education can be used to develop competent consumers and communicators of science information’, *Cultural Studies of Science Education*

<sup>37</sup> Ashton, J. 2021, ‘Covid-19 and the anti-vaxxers’, *Journal of the Royal Society of Medicine*

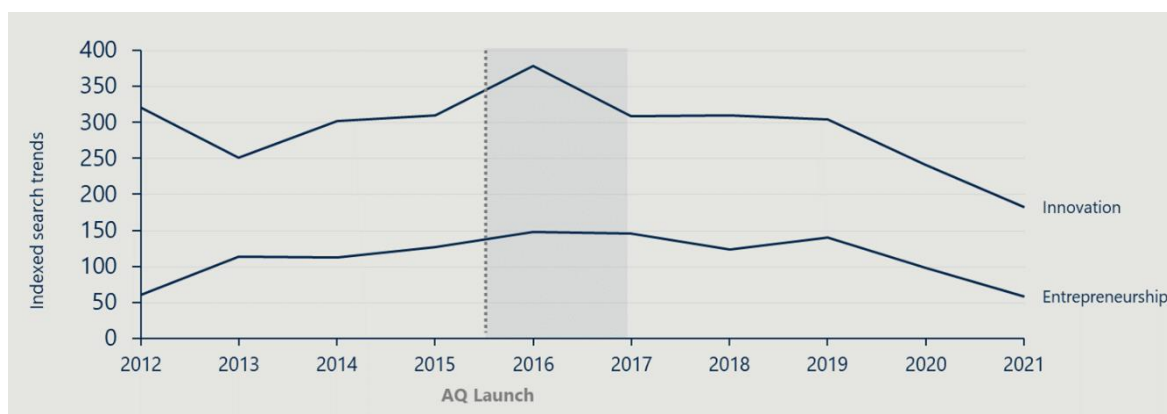
Evaluation survey findings were in line with broader perception survey results, 90 per cent of respondents were of the view that science, technology and innovation had positive or significant positive impact on the quality of life in Queensland. It is important to note however that respondents of the survey are likely to be participants in the innovation ecosystem which introduces a level of bias.

Analysis of Google search data shows strong spike interest in innovation and entrepreneurship in the years immediately following launch of AQ (see Figure 14), showing the co-relation between the launch of AQ and public interest in its subject matters. Participants in stakeholder interviews and focus groups reported that programs in the early years engaged stakeholders and created media ‘hype’ that led to an increased profile of innovation and entrepreneurship in Queensland. However, they reported that the “profile” of AQ investment has diminished in the last two or so years. One of the drivers for this could be front-loading of investment *Supporting Culture*, with 71 percent of program funding committed with the first year and a half of AQ initiation, represented by the shaded area in Figure 14. Comparative lack of funding for broad programs aimed at promoting culture of entrepreneurship and innovation in years since could’ve contributed to a decrease in interest.



“The raising of the profile of innovation and Queensland as a place of innovation has been the most significant change since the start of AQ. We went from being a lifestyle state that didn’t pay much attention to this, to putting Queensland on the international radar. AQ [through the size of investments and establishment of Chief Entrepreneur’s office] gave innovation and entrepreneurialism visibility, it brought out all the previously invisible activity, and endorsed it and promoted it. Queensland has shown it values role of innovation and entrepreneurship.” – IAC member 1

Figure 14 | Queensland-based Google searches for AQ related terms 2012-2021 (indexed)



Source: Google trends: Interest over time (accessed in October 2021)

### Exposure to science, innovation and entrepreneurship helps to develop aspiration and confidence

Innovation and entrepreneurship networking events, conferences, and roadshows have been key mechanisms for growing and developing culture of innovation and entrepreneurship. However, assessment of outputs from these activities (e.g. number of participants) is easier than outcomes which may have long lead times. Qualitative insights gathered from focus group and workshop participants show that:

- **Bi-directional events that create engagement were more effective than unidirectional conference-type presentations** because they built community and meaningful connections.
- **Activities of this type were particularly effective in regional areas** where they helped showcase possible educational and career pathways that were not visible to participants because of limited

access to 'role models'. However, for aspiration to be translated into educational and career outcomes, participants need to have access to relevant pathways.

- **Events were effective for existing entrepreneurs, who were given motivation and confidence to persevere** by seeing others further down the track that had succeeded, and at times made connections that led to funding or development of new ideas.

## **Brisbane and Queensland have established a strong reputation as a place to work and do business, and this translates into strong domestic migration**

According to the Digital City Index<sup>38</sup> which ranks world cities based on interest by international audiences as measured by a number of searches conducted by worldwide citizen, Brisbane holds a strong reputation for business, talent and investment. In 2018 it ranked Brisbane in the 14<sup>th</sup> place in the Asia region and Australia for investment, and 12<sup>th</sup> of talent in 2018. While this is a strong overall position, it is important to note that Brisbane still ranks behind Sydney (overall four) and Melbourne (overall six). However, no other Australian capital cities made the rankings (35 in total). AQ funded programs were perceived to build a positive profile of Queensland as a destination for investment, lifestyle and work. The Startup Catalyst, the Myriad Air flight from San Francisco to Brisbane with an airborne "pitch session"<sup>39</sup>, HotDesQ and creation and promotion of a Chief Entrepreneur were the programs frequently mentioned in interviews and focus groups as contributing to raising the profile of Brisbane and Queensland's international profile. This profile was put on the radar, or augmented in two ways:

1. Bringing Australian researchers, innovators and entrepreneurs directly to the attention of leading entrepreneurs, firms and influencers overseas, who could then connect them with their own networks and further opportunities otherwise beyond reach, growing Australia's presence in these international networks and events.
2. Signalling to the world – through the presence of a Chief Entrepreneur, Hot DesQ, investments in research centres and technology hubs and flagship innovation initiative AQ itself– that Queensland was a jurisdiction that highly valued innovation, science and entrepreneurship, and in doing so, acting like a 'lighthouse' for firms, innovators and investors and specialist talent who were searching for their next destination or venture.

Nationally, multiple data indicators point to Queensland's elevated reputation as a place to live and work. Net interstate migration of working age population to Queensland from other jurisdictions has consistently grown – both in number and proportion of total travellers from 46.21 per cent in 2014-15 to 63.63 per cent in 2019-20 (see Figure 15). The number of net interstate migrants to Queensland of working age has increased most years 2014-15 to 2019-20, only decreasing in 2018-19. As shown in Figure 15, this growth has outpaced all the other comparable jurisdictions.

Many domestic and international expats are returning to Brisbane, attracted by the combination of greater work opportunities in their industries alongside the drawcards of lifestyle and family. Some stakeholders interviewed identified Hot DesQ and Ignite Ideas as programs most associated with the attraction of domestic and international talent (on temporary basis to provide capability uplift in case of Hot DesQ).

The connections forged through Hot DesQ are reported to continue, providing sustained benefits to Queensland businesses and entrepreneurs in the form of fresh ideas, advanced thinking and greater networks that helped them grow their business. This finding is also reinforced by survey results, with 61 percent of respondents agreeing that Queensland is an innovative state (slight increase from 58 percent in Colmar Burton's 'Queenslanders' Perceptions and Attitudes to Innovation' in 2017<sup>40</sup>) – although this also reveals that Queensland has much room for improving its intra-Queensland reputation for innovation.<sup>41</sup>

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<sup>38</sup> *Digital City Index*, 2018, 'Digital City Index – Brisbane'

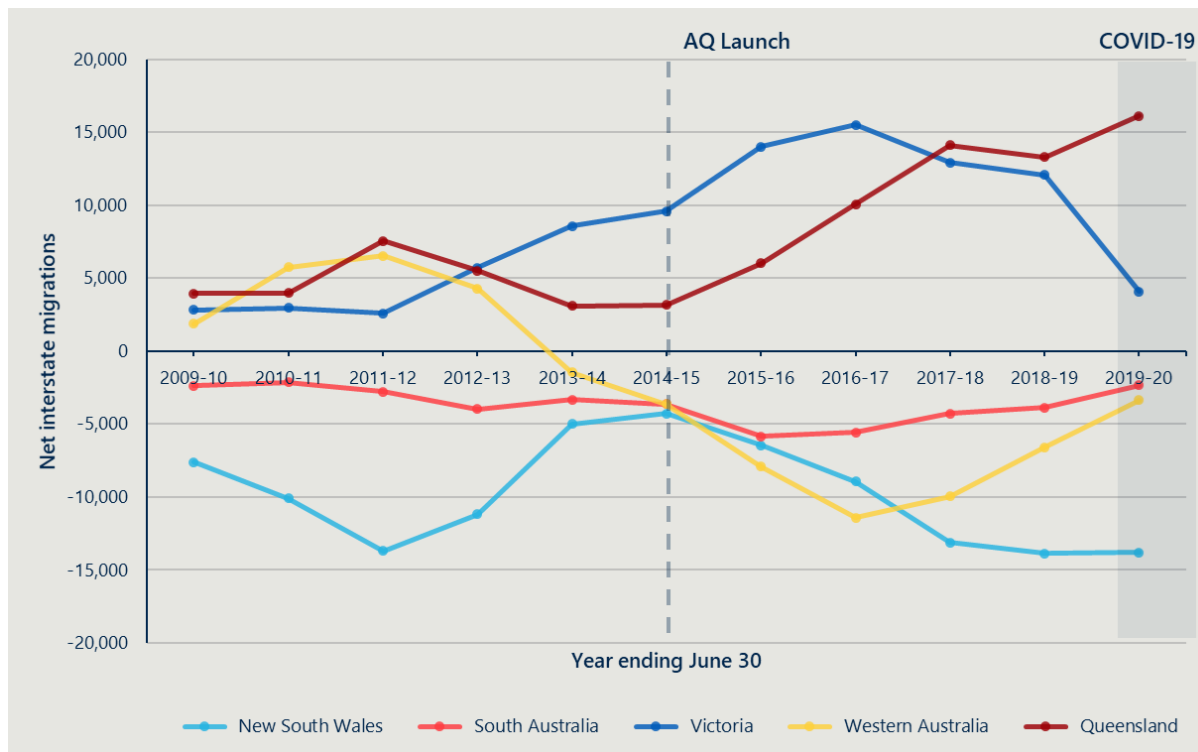
<sup>39</sup> More, T. 2018. 'Silicon Valley to Fortitude Valley: Queensland start-ups pitch ideas eight miles high', *Brisbane Times*

<sup>40</sup> Caveat is that differences in opinion may also be due to how respondents were sampled. Colmar Burton surveyed a broad cross section of general population, while the evaluation survey respondents are active participants in Queensland's innovation ecosystem.




This migration trend provides significant opportunities to develop and retain new talent and leverage capability and capacity they bring to grow Queensland’s jobs and productivity. This is further elaborated under the “Building capability” strategy (see section 4.2.3).

Figure 15 | Net interstate migrations for working age population (age 15 to 64)



Source: ABS Interstate Migration dataset



“Talent attracts talent. Hot DesQ was designed to inject global intensity, pace and ambition into Brisbane and Queensland; people from startups overseas. It was one of most successful programs, in part because these people were welcomed by 40-50 AQ community members. [Similarly] with the Catalyst and Venture programs we took small groups of people who were quite diverse, to places like London and Colorado. They developed good bonds which electrified and improved speed at which information flowed. The ventures that have come out of this are spectacular.”

- IAC Member #1

“AQ accelerated a lot of activity and put Queensland on the map, and on a global stage. Led to people asking about Brisbane and AQ.”

- IAC Member #2

Through Hot DesQ we had two entrepreneurs stay which was a great win for getting successful startups to the region”

- Regional hub leader #1

“With AQ funding we were able to run more local events and bring in visiting entrepreneurs to get the sharing of ideas and making broader connections... We love having people come into the region and bring ideas, we do not mind if they don't stay.”

- Regional hub leader #2

## AQ was one of the factors contributing to better business entry and survival rates in Queensland, although more businesses are still established in New South Wales and Victoria

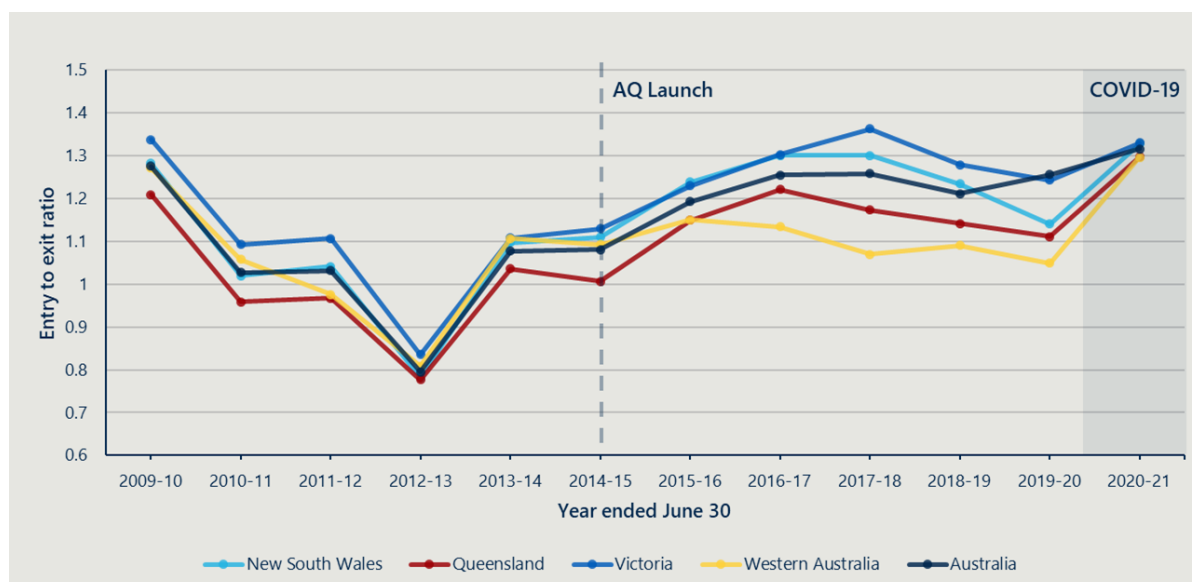
One of the ways that AQ aims to support entrepreneurial culture and increase entrepreneurial activity is through programs that provide support to current and future entrepreneurs to thrive. Initiatives such as the Female Founders Program, Industry Accelerators Program and Innovation Festivals provide SMEs with opportunities to share knowledge, access mentoring, network and collaborate. The focus on future innovators and early-stage businesses aims to promote more businesses to establish in the state and encourage survival rates of new businesses.

The business success rate in Queensland has been trending positively since the commencement of AQ (see Figure 16). Three indicators illustrate this trend:

1. **Business entry rates:** The compound annual growth rate (CAGR) of these from 2014-15 to 2018-19 is 4.32 percent (data beyond this point is impacted by COVID-19). This is up from a CAGR of -5.14 percent from 2009-10 to 2014-15. This growth puts Queensland well above resource-heavy Western Australia but below New South Wales and Victoria.
2. **Business exit rates:** In Queensland, business exit rates slowed since the launch of AQ (12.7 percent in 2016 compared to 12.0 percent in 2020-21, noting some impact of Government subsidies as a response to COVID-19) and were also slower than in New South Wales and Victoria. This indicates that AQ may have had an impact on increasing business survival rates.
3. **Business entry to exit ratio:** Queensland businesses' survival rate increased from 60.2 percent in 2016 to 69.7 percent in 2020-21. Overall, this has helped Queensland close the gap to Victoria in terms of businesses entry to exit ratio.

The AQ investment in programs targeting SMEs (including startups) and industry have contributed to supporting businesses and entrepreneurs to survive and be competitive. Program officials interviewed as part of this evaluation also described taking a proactive and hands-on approach to the businesses and entrepreneurs they were supporting – actively advising of, and promoting, potential networking or collaborative opportunities between synergistic businesses.

Figure 16 | Ratio of Business entry and exit rates



Source: Nous analysis of ABS data



"Angel investors aren't satisfied with long sales cycles, AQ funding acted as a bridge to support them as they launch, which can take a while due to their business structure"

- A female founder

"Culture changes slowly and goes across the board. You need a continued and consistent message that science and innovation is important and valuable, how it can change the world"

- Queensland program official

"If the funding for Regional Startup Hubs stops, we may not be able to continue to deliver what we do"

- Regional leader

## Conclusion

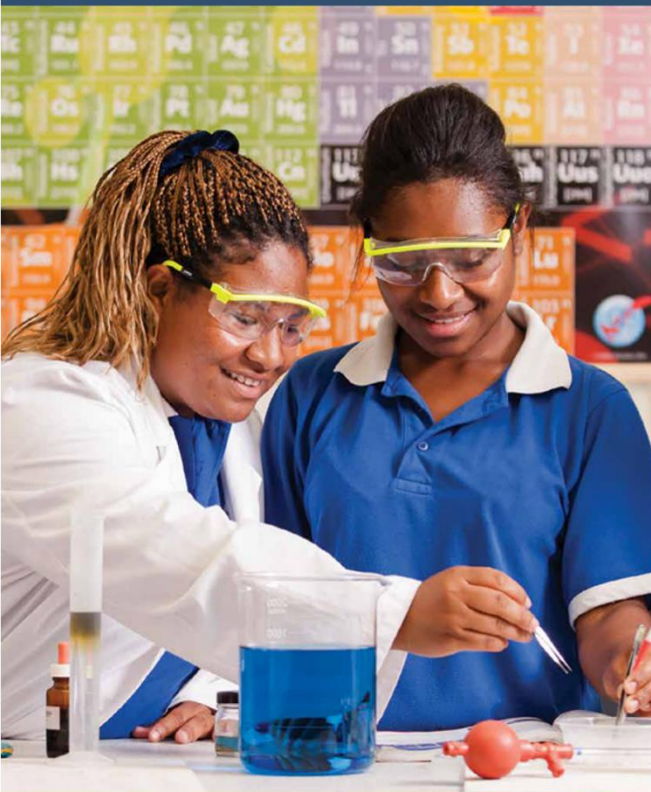
AQ's programs captured under *Supporting Culture* appear to have been successful in increasing exposure to science, innovation and entrepreneurship, in turn raising their "profile" across a broad section of Queenslanders. However, it appears that this interest has not been sustained, leading to opportunity to invest in maintaining the momentum and positive "buzz" built in early years of AQ.

Brisbane and Queensland have established a strong reputation (international and domestically) as a place not just to live, but also to work and do business, and this translates into strong domestic migration. Queensland now has the opportunity to leverage migration trends to grow knowledge economy capabilities and supply of talent.

AQ was one of the factors contributing to more favourable business environment, as indicated by improved business entry and survival rates in Queensland, but this still lags behind New South Wales and Victoria. Queensland's interstate migration increase is an opportunity to encourage SME growth and innovation.

# SNAPSHOT CASE STUDY: Supporting culture and building capability by investing in students

## OVERVIEW



A knowledge economy requires a deep and growing pool of talented people with skills in STEM and entrepreneurial mindsets. Advance Queensland primarily pursued this through two of its five strategies - Building Capability and Supporting Culture. This recognised that each reinforced the other, and that efforts were needed from early childhood through schooling and into higher education.

Programs for students took a multitude of forms and were provided by hundreds of entities, from the Department of Science and Office of the Chief Scientist (such as Engaging Science Grants and the flying scientists program), to the Department of Education (such as review of STEM education, Entrepreneurs of Tomorrow, and PhD scholarships, to participating universities and TAFEs), as well as hubs and other innovation facilities, and captured in their own internal reports (if at all). It is therefore difficult to know exactly how many programs and providers were supported by AQ or the number of participants they reached.

A modest estimate of expenditure on programs for future innovators and entrepreneurs (those in formal education and in their families through community events and activities) is \$13,737,549. This is 1.8% of the total \$755m expended 2015/16 to 2020/21. The real expenditure is likely higher as it would include proportions of the expenditure by hubs, such as the innovation centres in Rockhampton (in a partnership with Central Queensland University) and Cairns (in partnership with James Cook University), the Precinct, partners such as the Gondwana and universities' own programs, separate to AQ.

This limited visibility limits a robust understanding of the most effective investments and what contributed to, or limited, their success. This is problematic because Queensland needs a strong pipeline of talent to resource a knowledge economy.

## OUTCOMES AND IMPACTS OBSERVED

**Primary and secondary school teachers reported students participating in AQ programs developed a solid understanding of entrepreneurialism.** Students understood innovation as “helping fix a problem” and entrepreneurialism as creating something of value – whether this be commercial value (you can sell it for profit) or something that meets an unmet need. Teachers taught these concepts in tangible and hands-on ways, such as inventing a product that can support wildlife at school and then creating it using a 3D printer.

**AQ-funded programs reportedly led to teaching innovations.**

Teachers we consulted described changing how they taught some units of work because of the tools, training and technology they had acquired through their participation in AQ.

**Time and teacher shortages are barriers to school engagement**

Even where there is interest and funding support, teachers and academics working with schools reported it is difficult to fit AQ programs into an already very full curriculum. It also takes time for teachers to learn any necessary technology (coding, 3D printing), time to plan lessons, time to implement new approaches and resources, and of course, time to undertake professional development. Some schools described the prohibitive costs of paying for a relief teacher for a teacher to undertake PD off-site, while others – especially in regional areas -described the inability to acquire a relief teacher at all.

**School leaders also need to champion the changes**

Even where teachers recognise the value of investing their time in developing their – and their students – capabilities, without the support of school leaders, it is difficult or impossible to implement successfully.

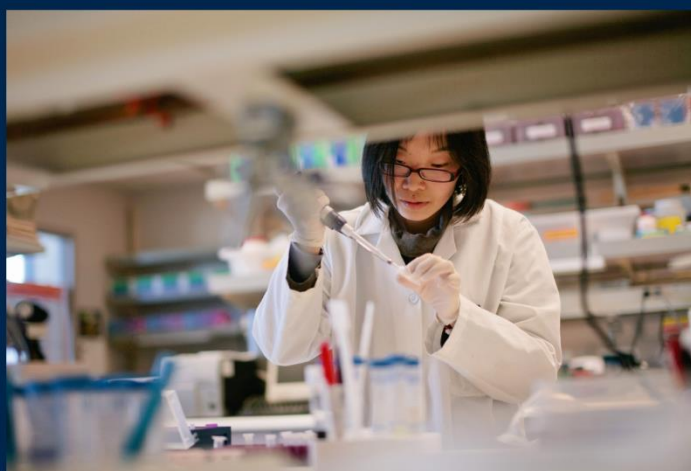
**An all-in-one package that removes participation barriers for teachers could expand student and teachers' capabilities**

These all-in-one activities could take the form of an incursion or excursion – for example a roving squad of science communicators and educational experts could move between schools – or clusters of schools in remote areas – delivering capability-uplift activities to the students and to the teachers, either simultaneous (in which the teacher learns alongside) or separately, in teacher-specific PD that they would undertake with colleagues using a “teach the teacher” model that builds collective efficacy and allows them to then undertake joint planning and shared teaching,

**University and TAFE students also benefit from entrepreneurial training and experiences**

These include developing creativity and critical thinking, as well as more applied capabilities such as design thinking and how to pitch an idea to different audiences. These skills are redeveloped in stand-alone courses at all levels (community, undergraduate, post-graduate) and for their teaching staff. Universities can also offer mentoring and exposure to STEM/start-ups/SMEs in which students can apply this thinking.

While Queensland universities were deliberately cultivating these capabilities and creating these opportunities for their students, evidence from consultations and desktop review indicates that these efforts have increased since the launch of AQ. More universities have placed greater attention on innovation and entrepreneurialism and are taking a more strategic approach, spear-headed by their own chief entrepreneur or office for entrepreneurialism. Under these more strategic approaches, course content is audited, gaps are identified, successful programs and teaching strategies scaled, so that more students have access to more – and higher quality – opportunities to develop and apply innovative thinking. This indicates a cultural shift, in which innovation is elevated in status.



## 4.2.2 Building capability

Providing Queenslanders with the creativity, knowledge and skills to drive innovation and support home-grown talent

BC1: Increase innovation capability

BC2: Develop, attract and retain talent (including STEM)

TARGET AUDIENCE* Breakdown by spend		PROGRAM TYPE* Breakdown by spend		CONTRIBUTING TO THIS STRATEGY	KEY PROGRAMS*
BUSINESS AND INDUSTRY	51%	GRANT	61%	70% OF PROGRAMS  93% OF RECIPIENTS	<ol style="list-style-type: none"> <li>1 Industry Research Fellowships</li> <li>2 Women's Research Assistance Program</li> <li>3 Schools of the Future</li> <li>4 AQ TAFE Pathways Scholarships</li> <li>5 Review of STEM education in QLD state schools</li> </ol>
UNIVERSITIES AND R&D	20%	OTHER / COMBINATION	20%		
GOVERNMENT	15%	PARTNERSHIP	9%		
STARTUPS AND ENTREPRENEURS	9%	PROCUREMENT	9%		

\* Of mapped programs (see Appendix H)

Other defined as programs that do not fall neatly into one of the following program types: grant, procurement, partnership, competition or event

### Although Queensland lags behind other jurisdictions, businesses have increased adoption of innovation

AQ directly and indirectly contributed to greater use of new and innovative tools and practices. 93 per cent of AQ recipients that responded to the survey conducted reported that they or their enterprise had 'improved or made greater use of innovative technologies' due to the support received.<sup>42</sup>



"Our staff became more innovative and were more comfortable using the technology which created more business."  
- Business, Small Business Digital Grants

"Developed a decentralised distribution system based on decentralised marketing."  
- Business, Business Development Fund

"We learned about the need for increased investment in building our digital footprint. We also learned we still have a long way to go to become 'world class' with our digital processes"  
- Business, Business Growth Fund

"We developed a much better understanding of social media and how to use it to improve our business."  
- Business, Small Business Digital Grants

Queensland Chamber of Commerce's longitudinal survey of more than 300 Queensland businesses in 2019 showed that while faster internet provided better foundations for using digital tools and technologies, digital confidence of Queensland businesses has dropped from 90 per cent in 2016 to 78 per cent in 2019, indicating potential lack of digital know-how.<sup>43</sup> However, this appears to have changed with COVID-19. It has been reported that COVID-19 and natural disasters accelerated the uptake of digital

<sup>42</sup> Data from survey of AQ participants and recipients, co-designed by Nous and DTIS, administered by the Queensland Government and analysed by Nous.

<sup>43</sup> Chamber of Commerce & Industry Queensland, 2020, 'Digital Readiness Report'

platforms resulting in positive outcomes on community collaboration, capacity building and digital literacy.

An example of this is uptake in telehealth, showing ten-fold increase in March 2020.<sup>44</sup> Queensland was well positioned to adopt this innovation, having been a leader in this space pre-COVID-19 (second in the country behind only Victoria<sup>45</sup>), largely due to its regional make-up. A survey of AQ participants found that 41 per cent of businesses reported that COVID-19 has a positive influence on their use of innovative technology, however it is impossible to untangle the role of AQ in supporting this uptake.

Despite this upswing in use of digital and technological solutions, Queensland still lags behind other jurisdictions in digital readiness. Data from focus groups and the survey indicate that this is due to one or more of three key factors:

1. lack of appropriate infrastructure (such as strong and reliable internet connections)
2. lack of capability or confidence using technologies
3. lack of awareness of the benefits and opportunities offered by greater use of digital technologies.

However, there are signs of improvement. Queensland has jumped up from sixth position in 2018 to third position in 2020 (among Australian states and territories) in Cisco's Digital Index on Technology Adoption.<sup>46</sup> This increased digital maturity of businesses can translate into increased competitiveness.<sup>47</sup> One of the programs contributing to this outcome under AQ is the Small Business Digital Grants Program which assisted small businesses to access digital technologies and services to help them work smarter, engage with the global economy and make the most of online business opportunities arising from digital disruption. Another program was the Knowledge Transfer Partnerships (KTP) program which placed a post graduate student in a business to work an innovative project for one year while being supported by their university. The program evaluation found that: 81 per cent of business recipients reported that the post graduate student transferred knowledge and skills to the business or organisation; and 84 per cent of businesses reported that their project was in an emerging industry.<sup>48</sup> While investments such as QCN Fibre, which improve digital connectivity across Queensland's regional areas, provide essential infrastructure to continue increasing Queensland ability to innovate.

While changing how government does business wasn't a key focus of AQ, it is important to note that anecdotal evidence suggests that Queensland Government has also adopted more innovative ways of doing business, at times as an unexpected benefit from involvement in AQ. Interviews and focus groups participants (both from within government and external to government) reported the use of agile project management practices, a collaborative approach to working with grant recipients, program providers and other government departments, in a way that delivered more efficient government processes and greater program take-up and benefits. These included more regular and direct engagement with program participants or delivers, to understand how they are tracking against their objectives, and if needed to link them with information, people or opportunities to help them overcome a challenge.

### **School STEM enrolments and academic performance paints a mixed picture**

The Engaging Queenslanders in Science Strategy, with a number of programs under AQ banner, aims to engage Queenslanders in Science including increasing STEM participation. It appears that there have been improvements in STEM school enrolments during the period of AQ implementation. Between 2012 and 2019 there has been an increase in senior STEM subject enrolments in Queensland schools, including a modest increase in the proportion of Year 12 enrolments in Physics (2.3 per cent), Mathematics B (1.9 per

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<sup>44</sup> *The University of Queensland*. 2020. 'New data shows surge in telehealth consults amidst COVID-19 pandemic'

<sup>45</sup> Jayawardana, D, Gannon B. 2021. 'Use of telehealth mental health services during the COVID-19 pandemic'. *Australian Health Review*

<sup>46</sup> Cisco. 2020. 'Building societal resilience through digital investment'. *Cisco Australian Digital Readiness Index*

<sup>47</sup> COVID-19 Innovation Roundtables with Queensland's Innovation & Start-up Community

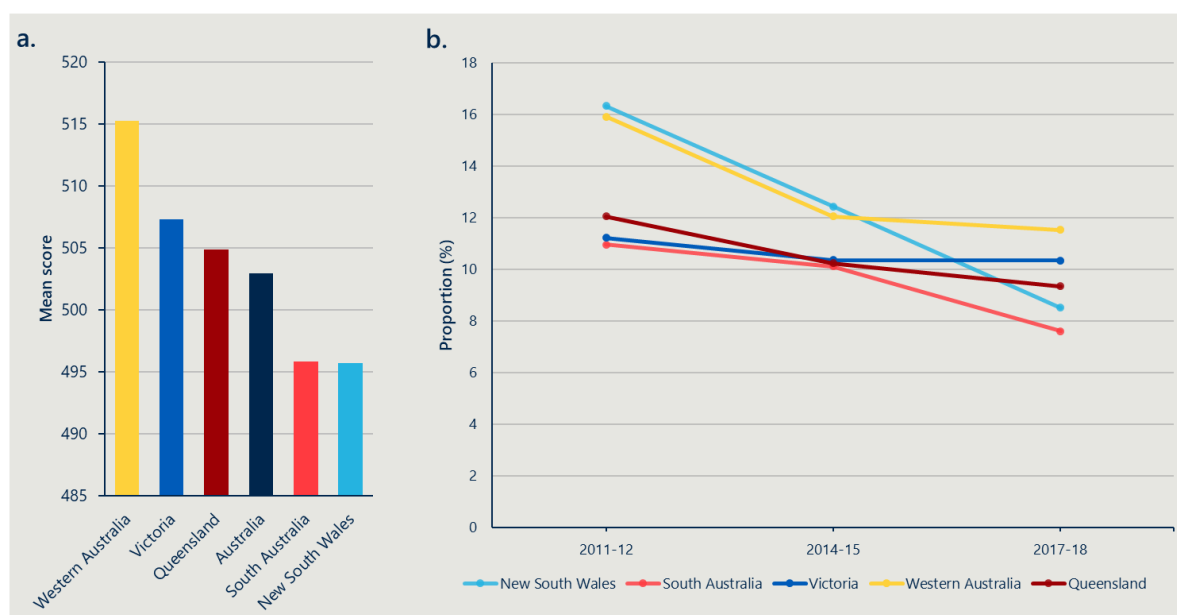
<sup>48</sup> Department of Innovation, Tourism Industry Development and Commonwealth Games, 2020. Knowledge Transfer Partnerships Program: A report on program outcomes. Brisbane, Australia.

cent), Mathematics C (1.5 per cent) and more significant increase in Chemistry (2.3 per cent) and Biology (5.0 per cent).<sup>49</sup>

Despite this increase in school level participation, STEM academic performance has shown mixed results:

- Queensland students' performance in STEM fields as evidenced through National Assessment Program for Literacy and Numeracy (NAPLAN) and for Science literacy (NAP SL) shows areas of strength. In particular, in scientific literacy Queensland students have had strong improvements between 2015 and 2018 in scientific literacy. The percentage of Year 6 students attaining proficient standards is the highest in Australia at 63 per cent, demonstrating an 18.5 per cent improvement (as a comparison, the next highest improvement was WA at 6.9 per cent, with all the other states behind).
- PISA testing results were less positive. When examining Queensland students' performance in PISA testing in scientific literacy, they were in the middle of the pack, with a mean score of 505 behind Western Australia and Victoria, 515 and 507 respectively, however remain above the national average despite some recent declines (see Figure 17)<sup>50</sup>.

**Figure 17 | Queensland students' performance in PISA testing (a. mean score in scientific literacy PISA 2018; b. proportion of high performing students in scientific literacy PISA)**



Source: PISA 2018: Reporting Australia's Results. Volume I Student Performance

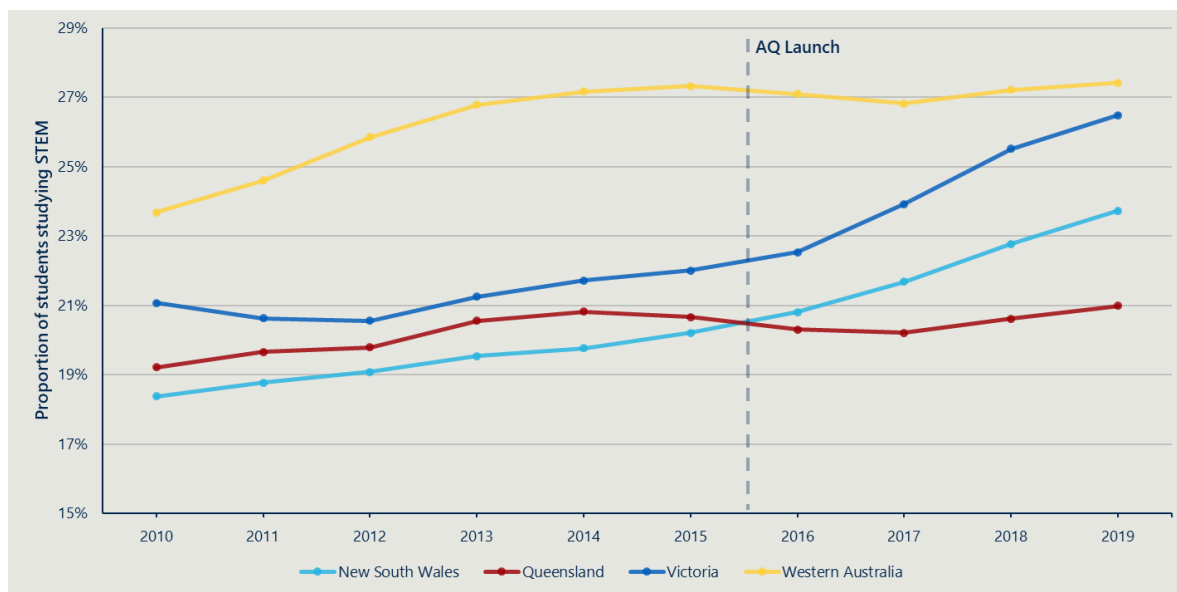
### VET & Higher education STEM enrolments show Queensland growth is lagging behind other states, indicating future capability gaps

The proportion of higher education students studying STEM has increased in Queensland since AQ's introduction, but not as fast as in other states. Additionally, during this time Queensland has also been recovering from a drop in STEM enrolments between 2014 to 2017, as shown in Figure 18.

<sup>49</sup> Data from Queensland Curriculum & Assessment Authority, processed by Queensland Department of Education. The changes in Queensland's senior assessment and subjects mean no valid comparisons can be made pre and post 2019

<sup>50</sup> PISA testing results are a small sample of all Australian schools (state, Catholic and Independent) with 133 Queensland schools participating from 740 across Australia.

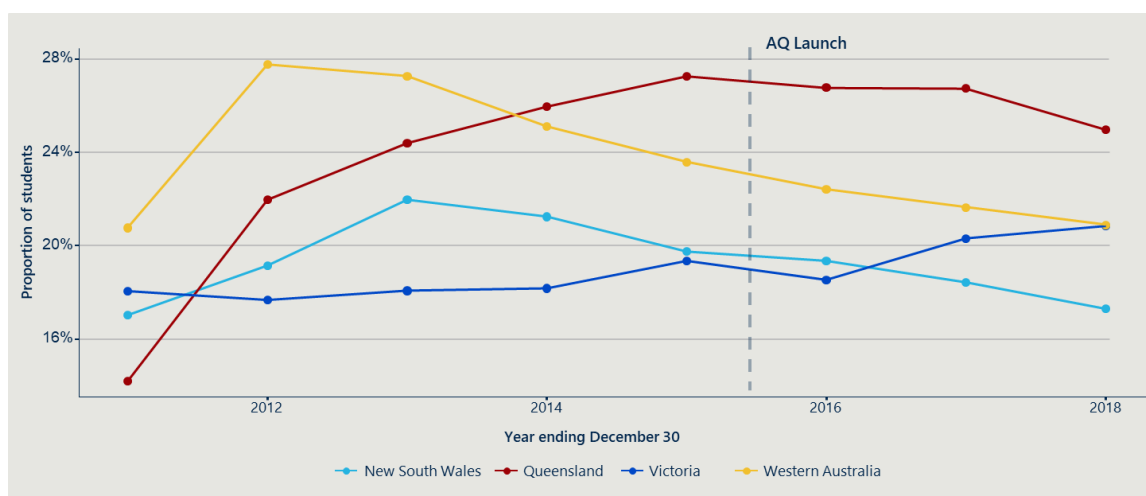
Figure 18 | Proportion of Higher Education students studying STEM by state



Source: Data Assets Warehouse for Nous (DAWN)

Further, Queensland exhibits the highest proportion of students doing STEM VET qualifications in comparison to other states at 25 percent (see Figure 19), indicating some success of AQ programs in this space (particularly TAFE Queensland Pathways Scholarship program). However, the overall strong result cannot be attributed to AQ because significant growth was pre-AQ and the number has been decreasing since.

Figure 19 | Proportion of school students studying STEM VET qualifications by state



Source: Data Assets Warehouse for Nous (DAWN)

Participation in the STEM study is often an indicator for the supply of 'future innovators', hence weaker performance in this area could lead to lack of capability to innovate in the future. However, it is important to note while AQ has supported STEM enrolments and performance, it plays only a small part in overall State and Federal Government support in this space. This means that, while AQ might be a part of the solution, assuming responsibility for addressing future gaps is well beyond the scope of the initiative.

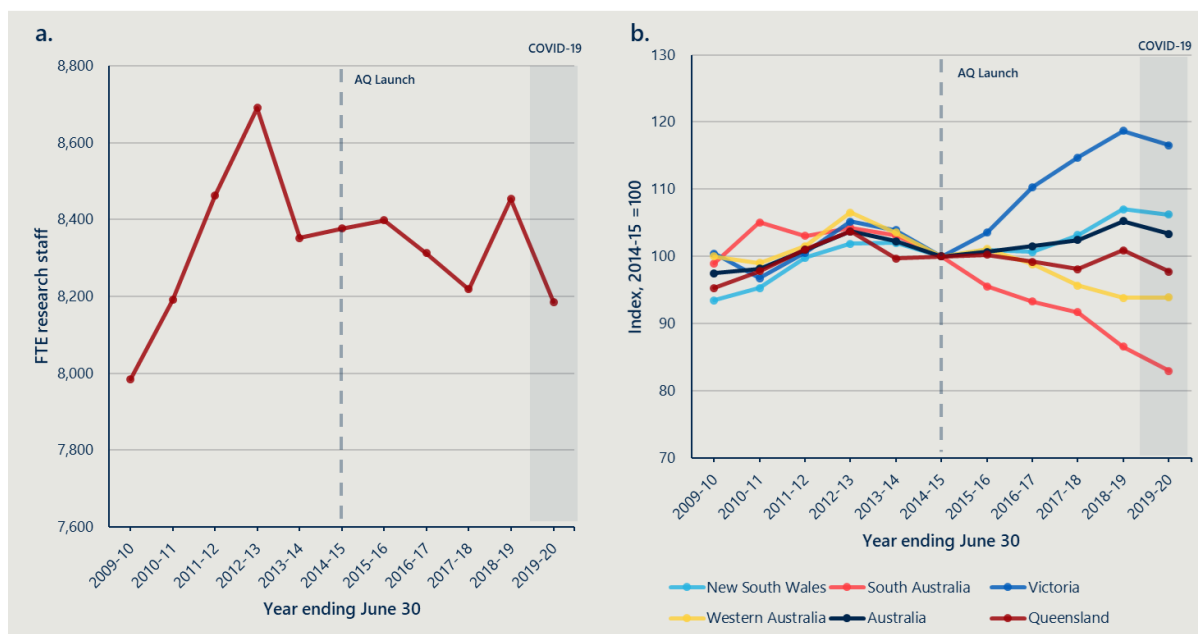


STEM skills are widely acknowledged to be critical skillset for development of innovative solutions to challenges, but they need to be completed by a range of other skillsets to support innovation – for example skills in commerce, marketing, sales and corporate finance subjects. OECD research<sup>51</sup> showed that a mix of technical and non-technical skills is required to enable innovation, with organisations drawing more heavily on different skills in that mix, based on the stage and maturity of innovations. This has been recognised by educational institutions, and interview and focus group participants report significant increase in program offering in entrepreneurship and innovation. University of Queensland’s release of first Entrepreneurship Strategy in 2018 is a testament to perceived importance of entrepreneurial education.

### Queensland’s current research capability performance is strong although numbers have stagnated

The number of research FTEs in Queensland decreased slightly during AQ from 8,377 in 2014-15 to 8,186 in 2019-20 (see Figure 20), noting that significant decrease between 2018-19 and 2019-20 was likely influenced by COVID-19 and consistent with other states. Further, pre-COVID-19 trends show that NSW and Victoria have been growing their research FTEs faster than Queensland. However, Queensland’s performance was significantly stronger than WA and SA, both of which demonstrated consistent and significant drops in research FTE’s since 2015.

**Figure 20 | Research FTE (a. Research FTE staff count in Queensland, b. Research FTE staff count comparison, index 2014-15 = 100)**



Source: Nous analysis based on Department of Education, Skills and Employment - Higher Education Statistics Data Cube (uCube) which is based on the student and staff data collections.

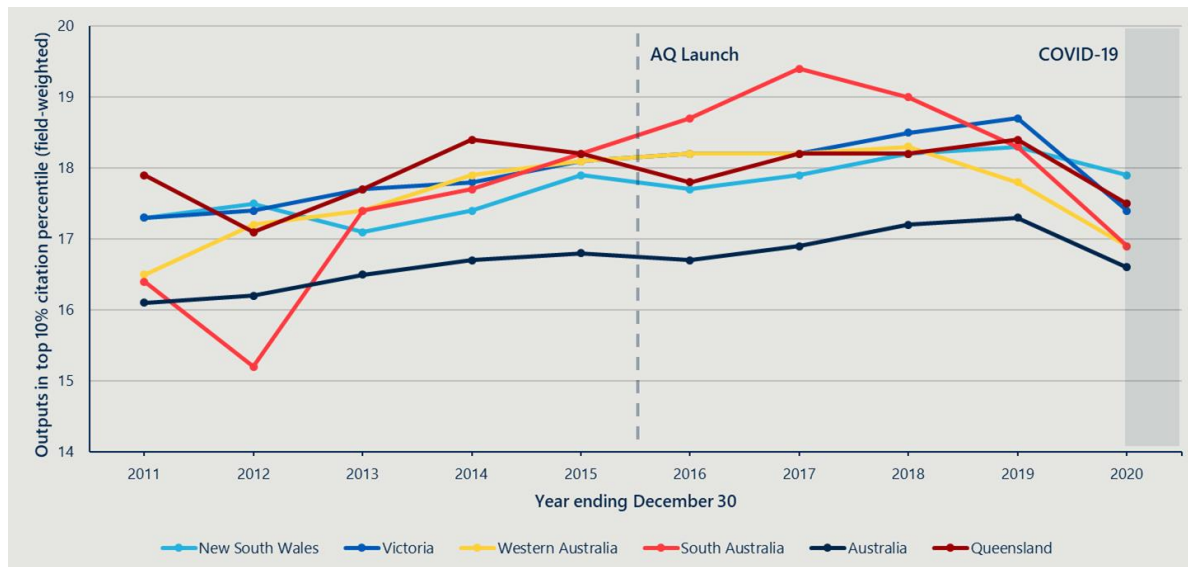
While Queensland may be showing a decrease in research staff, it is important to note that this area hasn’t been a significant focus of AQ design and funding, due to primary responsibility sitting with Federal Government. Hence it is critical to extend the discussion into performance of Queensland’s researchers. Analysis indicates that Queensland’s researchers are high performing in producing high quality research, on both national and international level. Two metrics were analysed to illustrate this:

1. Percentage of scholarly outputs which are highly cited
2. Raw outputs as demonstrated by number of scholarly outputs.

<sup>51</sup> OECD: Skills for Innovation and Research. 2011

A measure of research staff performance is the percentage of scholarly outputs which are highly cited. The particular metric investigated for this evaluation was the outputs in the top ten per cent citation percentile. Until COVID-19, Queensland performance was positive with a modest increase from 18.2 per cent in 2015 to 18.4 per cent in 2019 (see Figure 21). This figure places Queensland as the second highest amongst comparable states. When COVID-19 hit it dipped, although this is consistent with other comparator states.

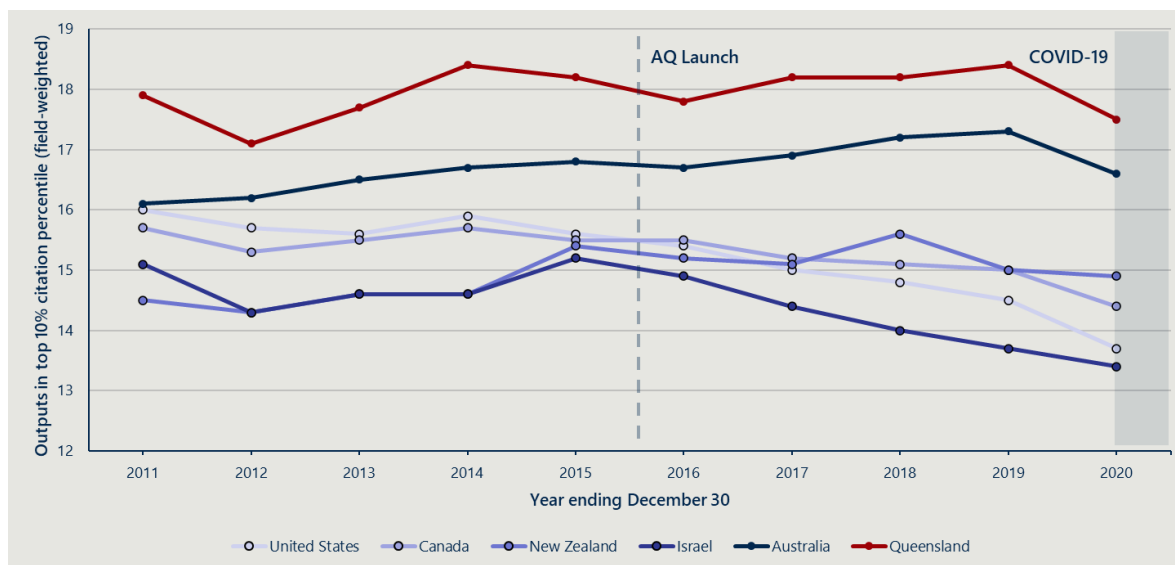
Figure 21 | Outputs in top 10 percent citation percentile domestic comparison



Source: SciVal

When looking internally, this figure for Queensland and Australia is higher than international comparators such as the United States, Canada, New Zealand and Israel (see Figure 22). This shows that Queensland is globally competitive in-terms of its scholarly outputs and researcher productivity.

Figure 22 | Outputs in top 10% citation percentile international comparison



Source: Nous analysis based on SciVal data and ABS National, state and territory population

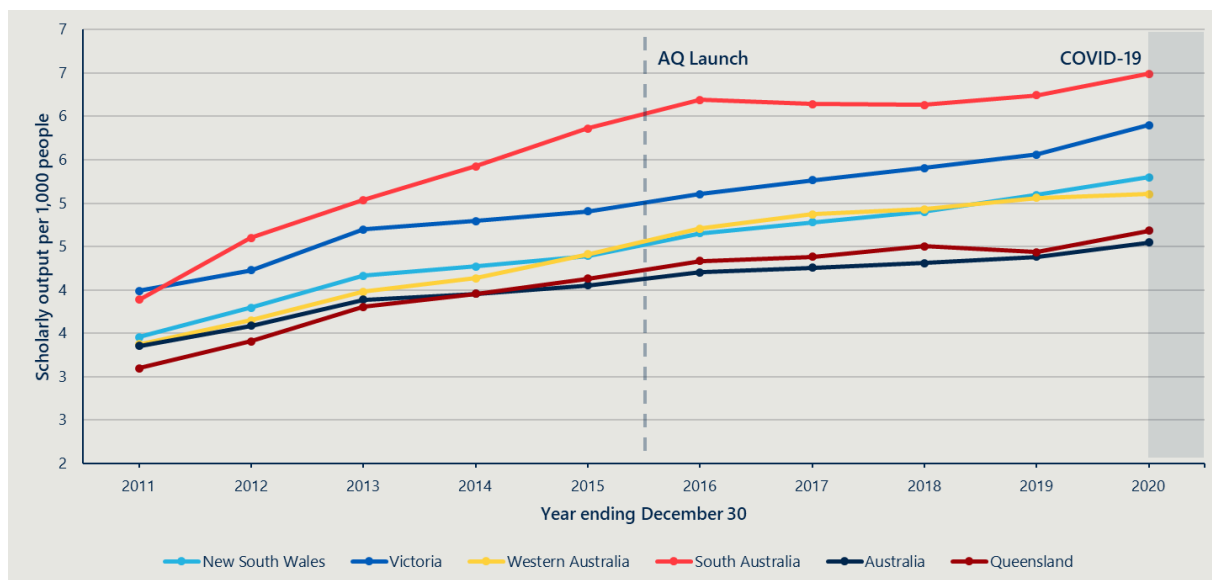
Finally, when looking at institutions, in 2021 University of Queensland was Australia’s top institution by a number of highly cited researchers (44 researchers), ahead of University of Melbourne and University of New South Wales (both 36 researchers).<sup>52</sup>

<sup>52</sup> Clarivate: Highly Cited Researchers 2021

AQ's suite of programs contributed to productivity of researchers. For example, Research Fellowships and PhD scholarships helped attract and retain high performing researchers; Women's Academic Fund and the Women's Research Assistance Program assisted female researchers in maintaining their career pathways.

In terms of raw scholarly output, Queensland has underperformed against comparator states. All comparator states have much higher scholarly output per 1,000 people, as shown in Figure 23. However, when contrasting this with Queensland's strong performance in citations, it suggests that Queensland might be outputting less in preference for quality.

**Figure 23 | Scholarly output per 1,000 people**



Source: Nous analysis based on SciVal data and ABS National, state and territory population

### Attracting and retaining talent remains a major challenge for Queensland

Securing and retaining highly skilled workers is a recurring theme reported among focus group participants and survey respondents. This indicates that while supply of talent has increased (see knowledge economy FTEs), demand continues to outstrip this supply. Over a quarter (26 per cent) of AQ survey respondents identified engaging people with the right skills, knowledge or technology as their main motivation for applying for funding or support from the Queensland Government.

This concern was especially pronounced in regional Queensland, underscoring the importance of distinguishing between Brisbane and the rest of the state. It was also echoed in the Rapid Review of Regional Innovation Programs<sup>53</sup>, highlighting that "suitably experienced and qualified local talent already in the region is a significant challenge in small regional centres". Additionally, IAC members and participants in focus groups for regional and rural participants spoke about majority of the talent being attracted to major cities, and difficulties in attracting skilled interstate workers to regional areas.

However, COVID-19 increased rates of migration from urban to regional areas, and in turn increased supply of talent in regions. The challenge that remains now is to develop local employment opportunities that are compelling enough to attract domestic workers who are currently working remotely in their city-based roles.

<sup>53</sup> Department of Innovation, Tourism Industry Development, 2021, *Rapid Review of Advance Queensland Regional Innovation Programs*. Brisbane, Australia

Figure 24 | Survey participants on the challenge of attracting and retaining talent



<p>"More funding for early to mid-career researchers who are post-PhD. This is the toughest time to survive as a research scientist and much talent is lost during this stage. That means much talent and innovation is being lost from Queensland if such highly trained people cannot find stable jobs."</p>	<p>"The government should create better conditions for business to start, fund and then stay (keep talent here). All the programmers are being poached to work in Sydney and Melbourne."</p>	<p>"We need to focus on talent development and retention, both in preparing school leavers for entering the workforce, and reskilling people to transition into highly skilled roles. Talent shortage is my single biggest impediment to business growth. Training is difficult, because we don't have access to the right programs in the regions... TAFE &amp; Uni's aren't delivering the right type of training to suit business needs, particularly advanced manufacturing. Migrating to the region is very difficult and costly due to our local housing crisis."</p>
<p>– <i>Researcher, Women's Research Assistance Program</i></p>	<p>– <i>Startup, Business Development Fund</i></p>	<p>– <i>Startup, Startup Catalyst</i></p>

## Conclusion

Despite some progress against objectives, more challenges remain under the *building capability strategy* than other strategies. One of the positive findings is the productive output of Queensland’s researchers in national and international spheres. In particular they are consistently outperforming most comparator states in producing highly cited research, indicating that research coming out of Queensland is of high quality.

However, Queensland’s pipeline of future capabilities and talent remains insecure. When compared to other states, Queensland’s performance on key enrolment and academic performance STEM metrics is mixed.. This is exacerbated in regions where challenges in attracting and retaining talent (including trained maths and science teachers) are greater, and are only expected to grow if overall talent pool becomes even more constrained.

Queensland has recently experienced a significant upswing in the use of digital and technology solutions. COVID-19 acted as a trigger for change, and AQ played a significant role in enabling the uptake, as evidenced by 93 per cent of AQ recipients reporting that they or their enterprise had ‘improved or made greater use of innovative technologies’ due to the support received. Despite this, Queensland still lags behind other jurisdictions in digital readiness, driven by lack of appropriate infrastructure, capability or confidence using technologies and awareness of benefits and opportunities offered by greater use of digital technologies. Without those foundational digital capabilities, Queensland businesses’ adoption of innovation will struggle to remain competitive in increasingly digitised world.

### 4.2.3 Fostering collaboration

Building networks and partnerships across organisations, sectors and disciplines in Queensland to spark creativity and ideas, diffuse existing knowledge, and engage with emerging opportunities

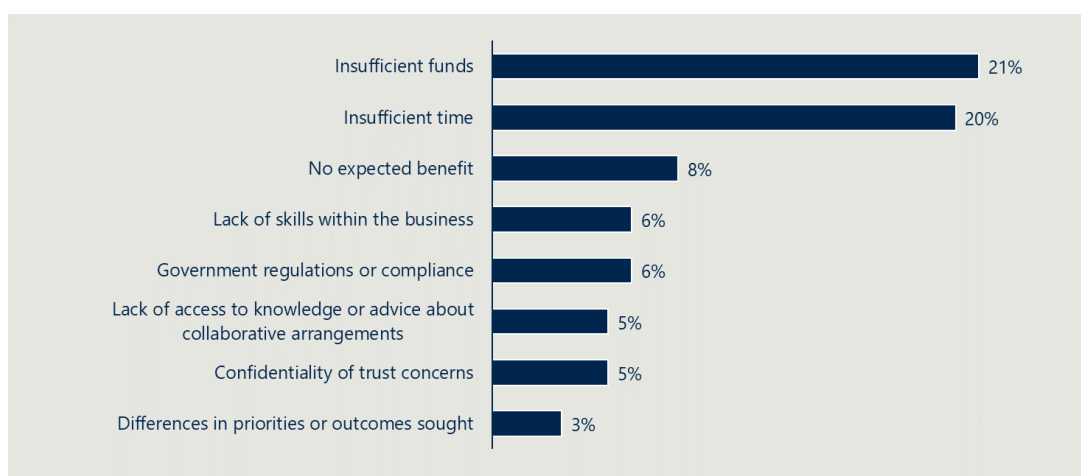
FC1: Build sustainable partnerships to deliver outcomes		FC2: Increase local and international networks	
TARGET AUDIENCE* Breakdown by spend	PROGRAM TYPE* Breakdown by spend	CONTRIBUTING TO THIS STRATEGY	KEY PROGRAMS*
BUSINESS AND INDUSTRY <b>51%</b>	GRANT <b>61%</b>	<b>55%</b> OF PROGRAMS  <b>45%</b> OF RECIPIENTS	<ol style="list-style-type: none"> <li>1 Advancing Regional Innovation Program</li> <li>2 The Precinct</li> <li>3 Hot DesQ</li> <li>4 Deadly Innovation</li> <li>5 Cairns Innovation Centre</li> </ol>
GOVERNMENT <b>27%</b>	PROCUREMENT <b>17%</b>		
STARTUPS AND ENTREPRENEURS <b>15%</b>	OTHER/ COMBINATION <b>13%</b>		
UNIVERSITIES AND R&D <b>5%</b>	PARTNERSHIP <b>8%</b>		

\* Of mapped programs (see Appendix H)  
Other defined as programs that do not fall neatly into one of the following program types: grant, procurement, partnership, competition or event

#### Queensland Businesses collaborate infrequently on their innovation, but once established, collaborative relationships tend to lead to strong business outcomes

Australian businesses rarely collaborate on innovation. OECD data from 2017 showed that globally innovation-active Australian firms are ranked 30th out of 36 in the OECD for any form of collaboration, with only 21.6 per cent of firms working with external parties on their innovations.<sup>54</sup> Business Characteristics Survey findings from 2019 reinforce this, with only 17.5 per cent of Queensland businesses declaring that they collaborate on innovation, just below national average of 17.9 per cent. Businesses that responded to the survey identified key factors preventing collaboration to be lack of time and funding, as shown in Figure 25 below.

Figure 25 | Ranking of factors preventing collaboration as identified by Business Characteristics Survey respondents in 2019 (% of organisations for which particular factor was preventing collaboration)



Source: Nous analysis using BLADE extracts provided by DTIS.

<sup>54</sup> OECD Science, Innovation and Technology Scoreboard: <https://www.oecd.org/sti/scoreboard.htm>

Despite this low performance, Queensland’s businesses and researchers seem to recognise the importance of collaboration. In fact, broadening and deepening connections with other entrepreneurs, innovators, businesses and researchers was a driving need for many AQ participants, regardless of their sector and location. Various forms of collaboration have been one of the top needs identified across different entity types, with 22 per cent of survey respondents identifying collaboration as either a motivating reason for applying for AQ support, or as a significant need faced by their enterprise.

Increasing collaboration is one of the key objectives of AQ, however, AQ participants identified collaboration outcomes as one of the ‘unexpected outcomes’ they gained from participating in AQ programs. This indicates that benefits from connections made were either not formally a key objective of programs they’ve participated in and happened as a ‘side-effect’; or collaboration was embedded in program design, yet was not explicitly understood by participants. Regardless of its origin, there has been a strong sentiment that AQ facilitated significant benefits by creating connections, and these ranged from inspiration to persevere to formal business partnerships. ARIP, Industry Research Fellowship and Ignite Ideas were programs most mentioned as having ‘unintentionally’ fostered greater collaboration.



<p>“You need connectors, who can assess in real time and use their strong networks and knowledge to help new or aspiring innovators and entrepreneurs access the right people at the right time... The connectors fix the asymmetry of information and provide new ideas”</p> <p>– IAC member</p>	<p>“I significantly increased professional network around Australia and internationally, related to my field of research. Eventually this has led to an internationally acclaimed book and collaborative research relationships”</p> <p>– Business, PhD Scholarships</p>	<p>“Participating in AQ events over a period of time, I picked up on these nuances that can be applied to our own business. Meeting other successful founders and hearing their stories of exporting has given us more confidence to aim higher and achieve more.”</p> <p>– Startup, Female Founders Program</p>
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This sentiment is supported by the results of the AQ survey which shows that those involved in AQ were able to achieve stronger growth in their network, with 50 per cent reporting a moderate or high gain in their network capability, compared to only 28 per cent of non-AQ participants.

### Infrastructure is a key enabler in supporting collaboration

Research recognises importance of physical infrastructure in supporting collaboration, particularly cross-sectoral collaboration, leading to both research and industrial outcomes. The Brookings Institution defines ‘innovation districts’ as: “Geographic areas where leading-edge anchor institutions and companies cluster and connect with startups, business incubators and accelerators”.<sup>55</sup>

The number of spaces to support this culture is one indicator for this objective in the AQ evaluation framework. Queensland currently has 28 major hubs and precincts<sup>56</sup> (up from 23 in 2016), out of which 18 are located outside of Brisbane and a number of them are AQ- supported.<sup>57</sup>

<sup>55</sup> The Rise of Innovation Districts: A New Geography of Innovation in America, Metropolitan Policy Program at Brookings, 2014.

<sup>56</sup> Mangan. J. Economic Significance of Innovation Precincts in Queensland, University of Queensland, 2020. Brisbane Australia.

<sup>57</sup> Department of Tourism, Innovation and Sport, A Place for Innovation, Queensland Innovation Places Strategy Discussion Paper, 2021. Brisbane Australia.



“Peer-to-peer connection, and accountability through the hubs led to real outcomes- developing patents, commercialising, 195 new jobs in [regional town]. Hubs helped facilitate entrepreneurs from woah to go”  
– *Regional entrepreneur/ business owner*

“The greatest challenge was that I’m expected to publish high-level research, but partners in industry, local government and community don’t understand or value that. In the same way, the university systems don’t always validate industry and community engagement.”  
*Academic that collaborated with a remote town*

“Best outcome was connecting with others through (Startup) Catalyst and hubs and their programs”  
– *Regional entrepreneur/business owner*

Brisbane’s share of co-working spaces, traditionally favoured by innovators who are looking for flexible workplaces that allow for cross-pollination, is the highest of all capital cities in Australia, taking up 2.8 percent of stock in the Brisbane CBD, noting COVID-19 might have impacted that trend.<sup>58</sup>

### Queensland’s share of research collaborations is high and growing at similar pace to comparator states

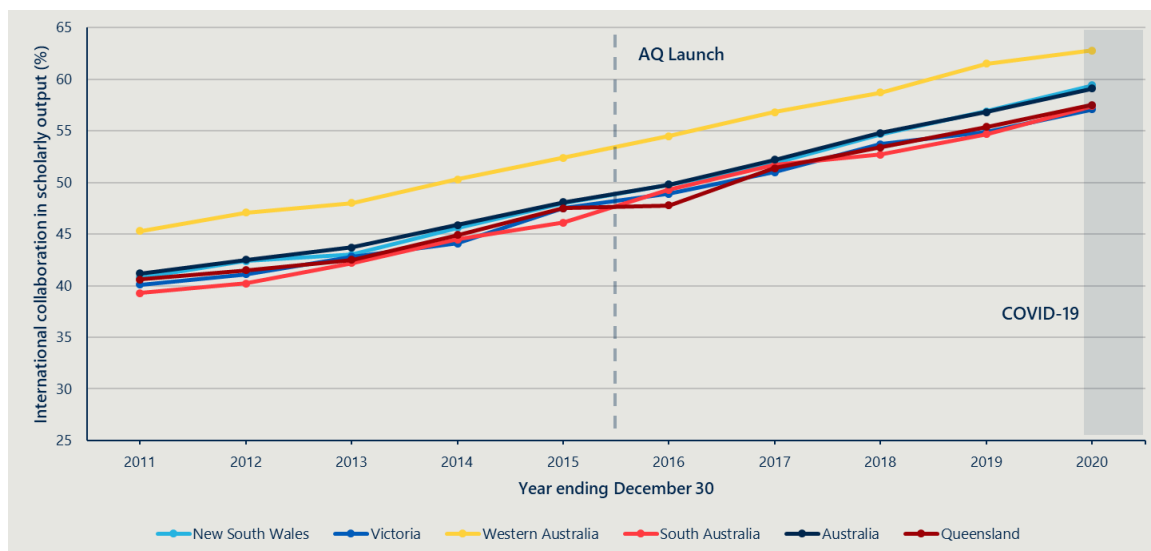
International collaboration, especially in research, is one of the key components of growing strong and diverse international networks. One of the examples of collaboration-focused programs in AQ is the Queensland Smithsonian Fellowships program which enables participants to visit and complete a research project at a Smithsonian Institution. The program demonstrated strong research outcomes in relation to the size of the investment, for example 70 co-authored publications between Queensland fellows and the Smithsonian Institution since the program began in 2001. An evaluation of the Fellowships program found that deeper collaboration has supported better research outcomes, by leveraging expertise and working more closely with Smithsonian Institution colleagues, as well as providing a deeper experience for the fellows.

Higher Education Expenditure on R&D (HERD) funding in Queensland sourced from overseas doubled in 2015-16 in comparison to a previous year, increasing by approximately \$30million in a single year. However, this trend was in line with other states, and has remained flat since the baseline (2014), indicating AQ didn’t result in any significant outperformance.

On the other hand, proportion of international collaboration in scholarly output in Queensland has increased since the launch of AQ (see Figure 26). The amount of this performance that is attributable to AQ is difficult to determine because this trend is in-line with a broader trend Australia wide.

<sup>58</sup> Alison, C. 2019. ‘Brisbane has biggest proportion of coworking space of any Australian city’. *Commercial Real Estate*

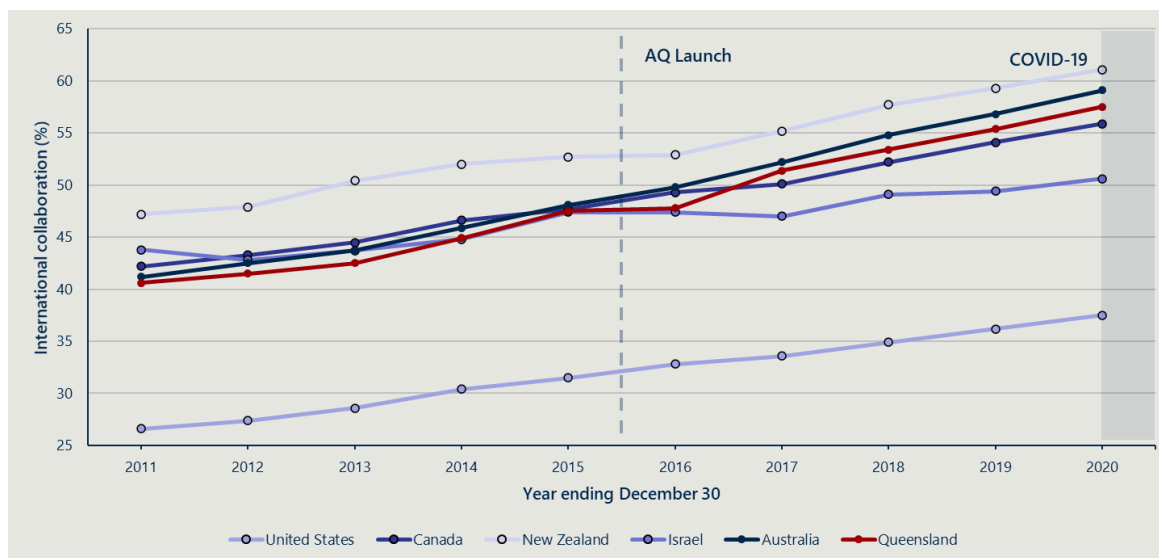
Figure 26 | International collaboration in scholarly output compared domestically (%)



Source: Elsevier – SciVal Research Performance Benchmarking

Although Queensland’s international collaboration in scholarly output is comparable to other Australian states, it outperforms most international comparator groups such as the United States, Canada and Israel (see Figure 25). This suggests that Queensland and Australia as a whole conduct a relatively large amount of international collaboration when conducting research.

Figure 27 | International collaboration in scholarly output (%)



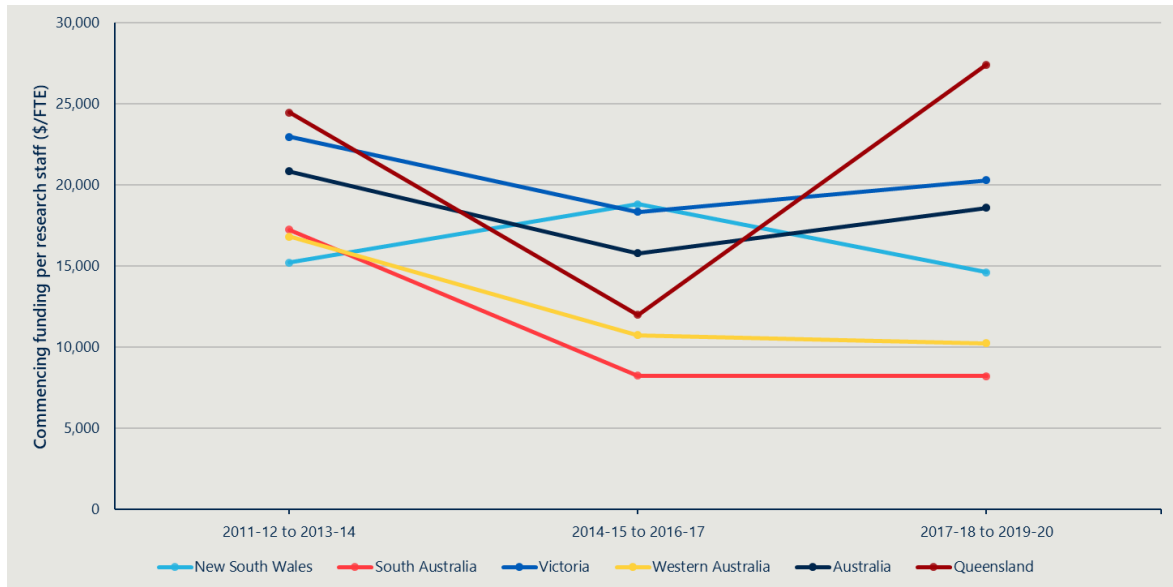
Source: SciVal

### Queensland’s performance in industry-research is strong when using domestic comparators however international comparison shows significant room for improvement

The ARC Linkage initiative involves a range of programs supporting research partnerships between university researchers and the private sector, government and other end users of research. As shown in the figure below, Queensland has shown recent strong uptick in performance, correlated with disproportionately large number of applications (see Figure 28). It should be noted that Queensland has historically performed well on this metric, but the outperformance in the latest period since AQ has been more significant. This builds on the research performance findings from “Building Capability” section, further expanding findings on high performance of Queensland researchers to also include stronger collaboration performance than other comparator states.



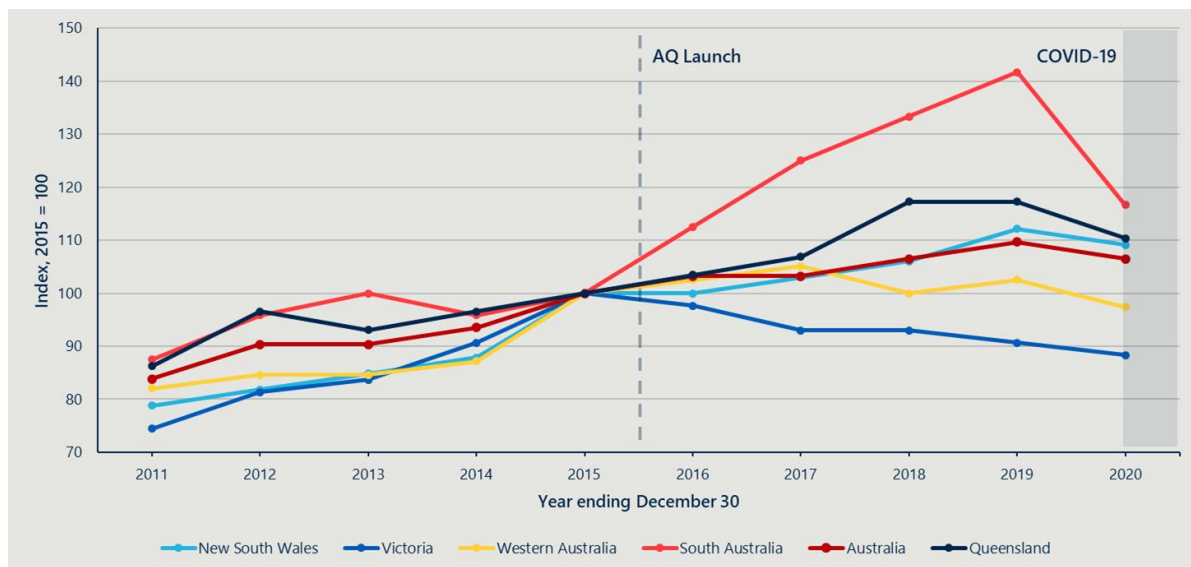
**Figure 28 | Jurisdictional comparison of ARC Linkage grants funding per research FTE**



Source: Nous analysis based on National Competitive Grants Program Dataset - ARC NCGP projects dataset, Department of Education, Skills and Employment - Higher Education Statistics Data Cube (uCube) which is based on the student and staff data collections. Note that each point represents the funding amount commencing each year across the research institutions in the jurisdiction; assessment processes for the grant changed in 2015-16 which may have impacted by comparison before and after that period.

The linkage between academia and industry is critical for converting theoretical research into applied solutions. One measure of this is percentage of academic-corporate collaboration in scholarly output. Queensland performs strongly in this metric domestically, haven risen at the second fastest rate among comparator domestic jurisdictions since the induction of AQ (see Figure 29).

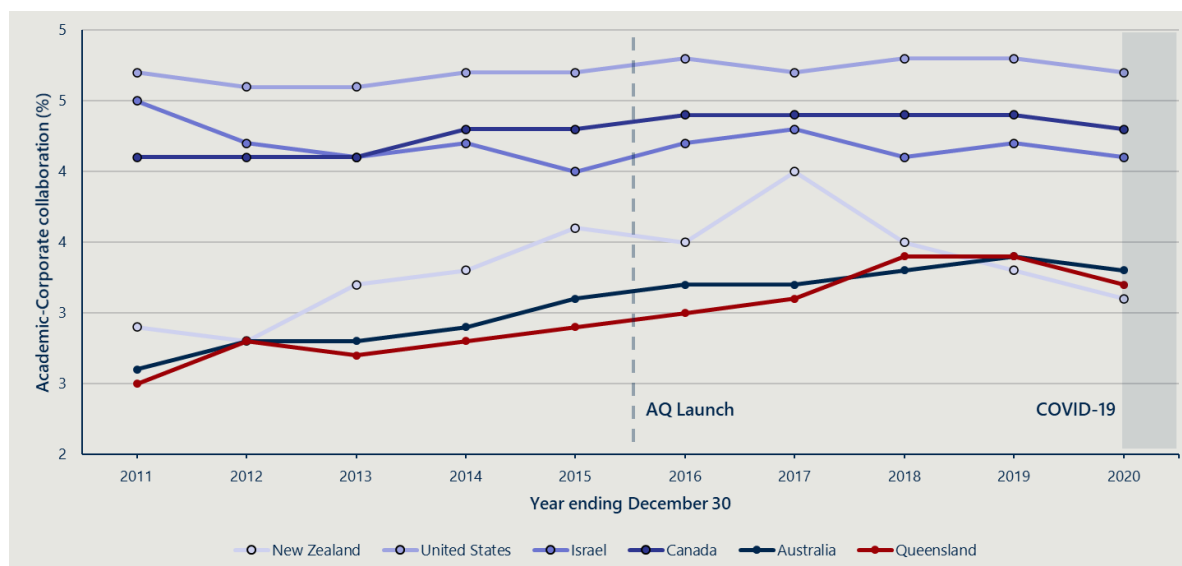
**Figure 29 | Academic-Corporate collaboration in scholarly output comparison, index 2015 = 100**



Source: Nous analysis using SciVal data

While Queensland's performance in academia-industry collaborations domestically might be strong, international comparison show there is still significant room for improvement. Queensland and Australia are both well below the United States, Israel and Canada in terms of this collaboration (see Figure 30). In fact, Australia ranks last amongst 26 OECD countries with respect to the proportion of businesses collaborating with higher education or public-sector research agencies on innovation.<sup>59</sup>

**Figure 30 Academic-Corporate collaboration in scholarly output (%)**



Source: SciVal

An environmental scan and consultations conducted for this evaluation found that a possible explanation of low collaboration lies in misaligned incentives between researchers and industry. University-based researchers are heavily incentivised to focus on academic grants and publications which are the core criteria on which universities base their hiring, promotion and contract extension decisions. They also carry teaching and committee duties. Together, this leaves little time or incentive to seek or extend collaborations with the private or not-for-profit sectors. Similarly, industry is disincentivised to engage with university-based academics due to:

- Misalignment of industry pace with academic work; and
- Limited ability to protect their IP (via, for example, patents) if academia publishes their work, which, in turn, impacts profits.

One program aimed at increasing research and industry collaboration was the KTP program, which incentivised SMEs to employ a postgraduate who is supported by a university to apply the latest research knowledge, resources and skills to solve a problem or improve a business process or product. Collaborations in this program resulted in:<sup>60</sup>

- 61% of business recipients increasing their profits;
- 71% of post graduates remained employed at the end of the one-year program and of this group, 66% would have sought employment interstate or overseas if they had not participated in the program; and
- 81% of business recipients reported they would recruit postgraduates directly from universities in the future.

<sup>59</sup> OECD Economic Surveys: Australia 2017

<sup>60</sup> Department of Innovation, Tourism Industry Development and Commonwealth Games, 2020. Knowledge Transfer Partnerships program: a report on program outcomes. Brisbane Australia. The KTP was an \$8million investment (2016-2019), and was in the top 10 AQ programs that supported jobs.

## Conclusion

Queensland businesses mirror Australian trend of low collaboration on innovation. However, businesses show recognition of the importance of innovation and seek out support through AQ and similar initiatives to overcome factors preventing them to collaborate, most frequently lack of time or funding. One of the consistently most praised achievements of AQ by participants has been the initiative's facilitation of connections that led to a variety of positive outcomes for participants, ranging from inspiration to persevere to formal business partnerships that led to new enterprises.

But, when looking at collaboration in research on a macro level, results are mixed. Queensland's researchers appear to be as collaborative as their interstate colleagues, both with other researchers and with the industries. However, while Australia sets a high benchmark for collaboration between researchers, its collaboration between industry and research is poor. This leads to opportunity to further incentivise collaboration between research and industry, given significant room to grow and potential beneficial outcomes for both sectors.

# CASE STUDY The roles of infrastructure in building an innovation economy

## OVERVIEW

### What counts as infrastructure and why does it count?

Infrastructure encompasses the physical, digital and organisational structures and facilities – such as buildings, roads, utilities and technology – needed for the operation of an economy. In this context, infrastructure refers to the investments in buildings, spaces, equipment and technology that enabled people to commence or extend their skill development, ventures, and work, be it cutting-edge research, or attending a networking event.

Infrastructure matters because without it, undertaking these ventures is more difficult, or even impossible. Often, the capital required to create or extend this infrastructure is beyond the ability of individuals, of companies or even institutions. Further, research by the Brookings Institute has found that infrastructure can be a valuable and catalytic place for governments to invest.






Gold Coast Health and Knowledge Precinct

### AQ-funded hubs in regional and metro areas played different and complementary roles which reflected different purposes

**Metro hubs were designed with the intention of serving the whole state through the provision of many programs and multi-purpose spaces.**

The Precinct (Brisbane's Fortitude Valley, pictured below) brings together Queensland's innovators, researchers, entrepreneurs, investors, mentors and more under one roof. It is also the location of the Office of the Chief Entrepreneur, the XR Hub and the new Artificial Intelligence Hub. The Precinct includes co-working, networking and event spaces, offers various programs to build capabilities of individuals and of enterprises, and provides a "soft landing" space for entrepreneurs and researchers visiting from regional areas, interstate and overseas.

**In regional areas, hubs provided many of the same services (a place to collaborate, work, build capabilities and network) while also responding to practical and applied ways to the existing local industry or research strengths, where the potential for impact on the economy and job creation was greatest.** In doing so, they sought to overcome the metro-regional, 'digital divide' and other infrastructure gaps, attract and retain talent, and encourage further investment. A review of the funded hubs and partnerships indicates alignment with the directions to "back [Queensland's] strengths as set out in *Building our Innovation Economy* (DTIS 2019), specifically:

-  Build world-leading clusters: help business, industry, social enterprises, training providers, researchers and entrepreneurs to work together and collaborate to drive innovation in industry, such as the Cairns Innovation Centre.
-  Position Queensland as a global testbed for new technology: attracting new investment and creating opportunities to be world leaders (primarily through acquisition of specialist equipment and facilities).
-  Prepare industry for change: encourage development and uptake of new technologies, processes and capabilities that create jobs in our industries.
-  Focus our efforts by backing existing strengths.

Boggo Road Station Precinct, specialising in health, science and education jobs of the future



### Examples of regional hubs funded though AQ include:

- The Rockhampton Technology and Innovation Centre, in partnership with Central Queensland University, which focuses on manufacturing innovations, engineering, communications, technology and design, and is co-located with the Advanced Manufacturing Hub.
- The Agtech and Logistics Hub in Toowoomba, which will deliver a series of open innovation and acceleration programs that will fast-track the development of agriculture technology.
- The Smart Precinct NQ in Townsville as part of a North Queensland investment, innovation and industry catalyst project. This hub seeks to support up to 100 SMEs in its first two years and will offer extensive educational and developmental programs for students, industry and the community,
- Cairns Innovation Centre, in partnership with James Cook University and the Commonwealth Government, is home to a \$30million Ideas Lab, contains specialised facilities, flexible workspaces and meeting rooms, and hosts innovation and networking events.

## CASE STUDY What helps or hinders the success of a hub?



### Some regional hubs are not sustainable without support

Consultations with regional leaders revealed that new and existing innovation hubs are facing a funding cliff, or are already supplementing government funding with significant unpaid labour and inputs. This financial pressure limits the capacity of hubs to plan into the future with confidence, to hire or engage the best talent, or to effectively cater to the needs of the local population.

*"[Our smart hub] got a sizeable grant plus \$25k/year, each year. Helped us run our facility. Employed digital engagement officer, got message out re-establishing ecosystem, breaking down barriers, physically move things around (hands on help that is consistent), run programs... If the funding for regional hubs stops, we may not be able to continue to deliver what we do, at the scale we do, which would be very sad." - Regional hub leader*

### Infrastructure alone is inadequate – clear KPIs, information management, capabilities and governance are also needed for success.

Hubs with the highest foot traffic, engagement, effective CRMs and communications specialists were observed as most successful in pursuing local and state goals. Without a critical mass of people and programming (courses, events, spaces), it is difficult for infrastructure to achieve their goals of building capabilities, supporting culture, fostering collaboration and increasing investment. However, these in turn rely upon effective communications, record keeping, governance.

Use of contracts with specific KPIs (key performance indicators) on these critical success factors could set up more hubs for success. These KPIs could target and measure foot traffic, website traffic, event attendance and participation (virtual and in-person), social media engagement, staff recruitment and retention success – particularly of communications specialists and program managers), and CRM.

## EXAMPLES

In Gladstone (pictured right), a 'boots on the ground' workshop with Rio Tinto and other big players in the "resource region" presented local SMEs, student, academics and engineers with specific examples of products which could be made locally, but were not. This directly responded to immediate supply-chain issues.

The program, strengthened through the manufacturing hub, built relationships and made the community more aware of what innovation and entrepreneurialism entailed in their context. Participants involved are now applying for a major grant.

The Precinct has a large and growing presence in Queensland, evidenced by a high and growing utilisation rate across its 7,500 square metres, a full events calendar, and several magnetic tenants – including the Chief Entrepreneur and multiple start-ups. Part of this success is attributable to investments in quality information and communications systems and large number of events – 170 in its first year – which led to growing interest and momentum.



## 4.2.4 Increasing investment

Providing Queensland businesses with access to capital to support innovation and increase business survival rates

I1: Grow pipelines of investable products / services		I2: Build access to capital	
TARGET AUDIENCE* Breakdown by spend	PROGRAM TYPE* Breakdown by spend	CONTRIBUTING TO THIS STRATEGY	KEY PROGRAMS*
BUSINESS AND INDUSTRY <b>80%</b>	GRANT <b>86%</b>	<b>47%</b> OF PROGRAMS	<ol style="list-style-type: none"> <li>1 Business Development Fund</li> <li>2 Ignite Ideas Fund</li> <li>3 AQ Industry Attraction Fund</li> </ol>
GOVERNMENT <b>10%</b>	OTHER / COMBINATION <b>11%</b>		
STARTUPS AND ENTREPRENEURS <b>8%</b>	PARTNERSHIP <b>2%</b>	<b>35%</b> OF RECIPIENTS	<ol style="list-style-type: none"> <li>4 Qld Govt Research Infrastructure Co-Investment Fund</li> <li>5 Integrated Care Innovation Fund</li> </ol>
UNIVERSITIES AND R&D <b>2%</b>	PROCUREMENT <b>1%</b>		

\* Of mapped programs (see Appendix H)  
Other defined as programs that do not fall neatly into one of the following program types: grant, procurement, partnership, competition or event

### Participants of AQ reported greater access to capital and funding compared to their peers, but overall venture capital has not grown in line with other states

The vast majority (94 percent) of survey respondents who identified themselves as participants in an AQ program of any format, monetary and non-monetary, reported improved access to capital/funding. Of that, 49 percent stated that this benefit represented a 25 percent or more increase in funding or capital. In the same period, access to capital/funding outcomes were significantly more modest for those who did not participate in AQ, with only 67 percent reporting an increase in access to capital or additional funds.

Venture capital (VC) and access to other sources of private investment were identified as key requirements for the creation of a self-sustaining innovation eco-system<sup>61</sup>. Kaplan and Lerner estimate that roughly one-half of all true initial public offerings (IPOs) are VC-backed even though fewer than one-quarter of one percent of companies receive venture financing<sup>62</sup>. Venture capitalists are often entrepreneurs themselves that have enjoyed success, grown their capital and are now looking to invest a portion of it by providing capital for businesses who are in early commercialisation, emerging growth and early expansion phases.

Venture capital market is a vital source of funding required to achieve economic growth. However, it also has some limitations if it was relied on as a sole funding source for achieving AQ outcomes. Some of those are summarised below, as captured in focus groups, interviews and survey feedback:

- **Venture capitalists tend to have a shorter-term return-on-investment objectives, while government is focused on longer-term objective of building strong Queensland economy.** This means that at times venture capitalists might prefer short-term profit, at expense of sustainable job creation. This means that some businesses might be “left behind” and not considered for investment by venture capitalists, for example established businesses (as opposed to lean start-ups) or businesses that don’t offer products and services that are easily scalable.
- **Government might find some industries, capabilities or processes more attractive for investment than venture capitalists might, due to its strategic importance,** including for example securing sovereign capability. This may mean that some strategically important investments for the government

<sup>61</sup> Interviews and focus groups with Queensland-based innovators

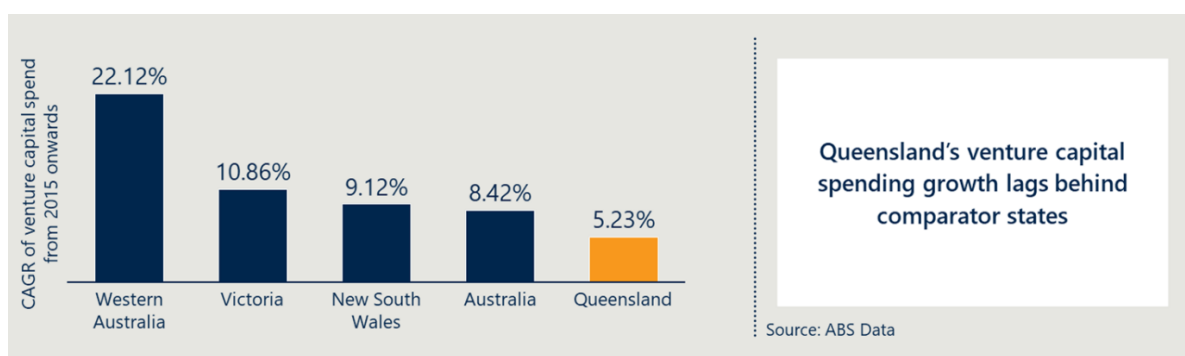
<sup>62</sup> Kaplan and Lerner. *It Ain't Broke: The Past, Present, and Future of Venture Capital* (2011)

might not be recognised as such by the venture capital industry without government signalling or different type of involvement.

- **Venture capitalists typically invest later in the commercialisation lifecycle, when proof-of-concept is available and initial market interest is validated.** This often leaves innovators without access to capital in early stages of the commercialisation process. Female entrepreneurs and Aboriginal and Torres Strait Islander entrepreneurs each independently raised this lack of access to venture capital as the biggest obstacle they faced in growing and sustaining their business prior to this proof-of-concept stage.
- **Venture capitalists tend to show preference for investing in what they are familiar with** – either industry they operated in or location they came from. Participants in interviews and focus groups reported that venture capital growth in regions frequently comes from successful businesses originating from that region, with mature enterprises and business leaders looking to re-invest in areas and industries that they are already familiar with. Female entrepreneurs in particular noted they found that some male venture capitalists were harder to convince of the value of their enterprise/innovation or their seriousness and credibility as entrepreneurs and CEOs. They attributed to the fact that as women and mothers, they did not ‘look’ like typical entrepreneurs or start-ups and thus had to work harder than (for example) men and those not juggling family responsibilities. This means that we are likely to see significant uptake in VC investment in regions and women entrepreneurs when those demographic groups of entrepreneurs are accomplished and ready to re-invest. This, however, can lead to long lag times in benefit realisation as business develop, mature and re-invest in future ventures; forming a cyclical, and self-sustaining venture capital environment.

Due to the above limitations, venture capital alone is not sufficient to achieve all *Increasing Investment* objectives of AQ. AQ shares a similar role in providing capital to enable commercialisation and growth; and acts in parallel with venture capital, using different decision-making criteria than traditional venture capital industry. In the four years following the launch of the AQ initiative, venture capital spend on Queensland-based companies experienced a compounding annual growth rate of 5.23 percent. This lags behind other Australian comparator states and the Australian average (8.42 percent). Therefore, slow venture capital growth (compared to comparator states) may suggest that AQ has displaced venture capital spending in Queensland or imply an immature VC market (see Figure 31). Survey and focus group feedback indicates that this was not the case for AQ participants. On the contrary, survey respondents often indicated that AQ support and funding often acted as a signal of quality to the VC market and enabled participants to also attract private funding. An important implication of this is that through AQ funding decisions, government influenced broader investment environment, resulting in government and private funding becoming more concentrated in successful AQ recipients.

**Figure 31 | CAGR of comparable Australian States**



Note: South Australia excluded due to ABS data redaction

### Queensland Government and Businesses are investing heavily in R&D

Investment in R&D is required to develop ideas, tools and technology. Although the benefits of R&D spend are not immediately realised, there are significant positive effects of public sector research spend

on state productivity.<sup>63</sup> While the return on investment (of private business R&D spend) is 25-30 percent, with an additional 25 percent of social rate of return observed as others benefit from the research.<sup>64</sup> However, the early-stage nature of R&D spend means that benefits are not immediately realisable and will not be directly measurable. Instead, government, research and private spending can be used as a mechanism for gauging the benefits that are to occur in the future.<sup>65</sup>

Within Queensland, spend on R&D has increased across all four major indicators: government expenditure on R&D (GOVERD), business expenditure on R&D (BERD), private non-profit expenditure on R&D, and higher education expenditure on R&D (HERD).

Queensland has out-ranked comparator states in R&D investment growth since the implementation of AQ (shown in Figure 32 and Figure 33). State government funding is one of the driving factors behind this growth, recording a 34.75 percent increase in spending from the 2015 financial year to the 2019 financial year. However, R&D spending (as a whole) has decreased as a proportion of GSP. Queensland has also been able to attract external R&D investment, with the share of Commonwealth R&D funds received increasing from 11.39 percent to 12.4 percent between FY15 and FY19.<sup>66</sup> This highlights a strong research base and increased competitiveness in the national funding arena, and comparable growth in GOVERD that is comparable with Israel, generally considered to be an innovation leader.

**Figure 32 | Queensland state R&D expenditure aligns with international comparators (GOVERD)**



<sup>63</sup> Georghiou, L. 2015. 'Value of research'. *Policy Paper by the Research, Innovation, and Science Policy Experts (RISE), European Commission*.

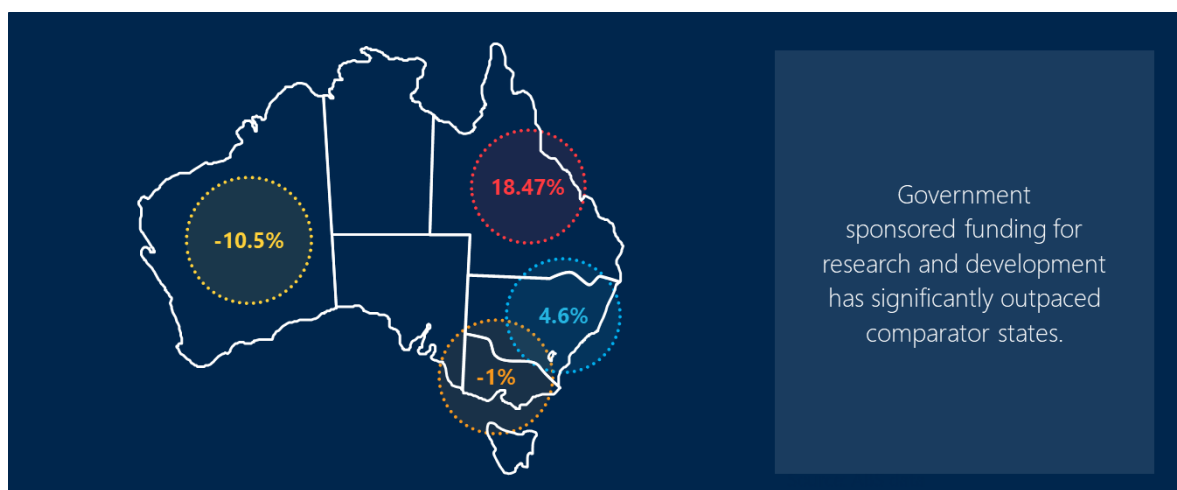
<sup>64</sup> *Standing Committee on Science and Innovation, House of Representatives*. 2003. 'Riding the Innovation Wave: The case for Increasing Business Investment in R&D'.

<sup>65</sup> ABS data on GOVERD and BERD are released in alternating, two-year periods

<sup>66</sup> *Australian Bureau of Statistics*. 2020. 'Research and Experimental Development, Government and Private Non-Profit Organisations'



Figure 33 | Growth in government spend on R&D (GOVERD) since 2015 (% change)

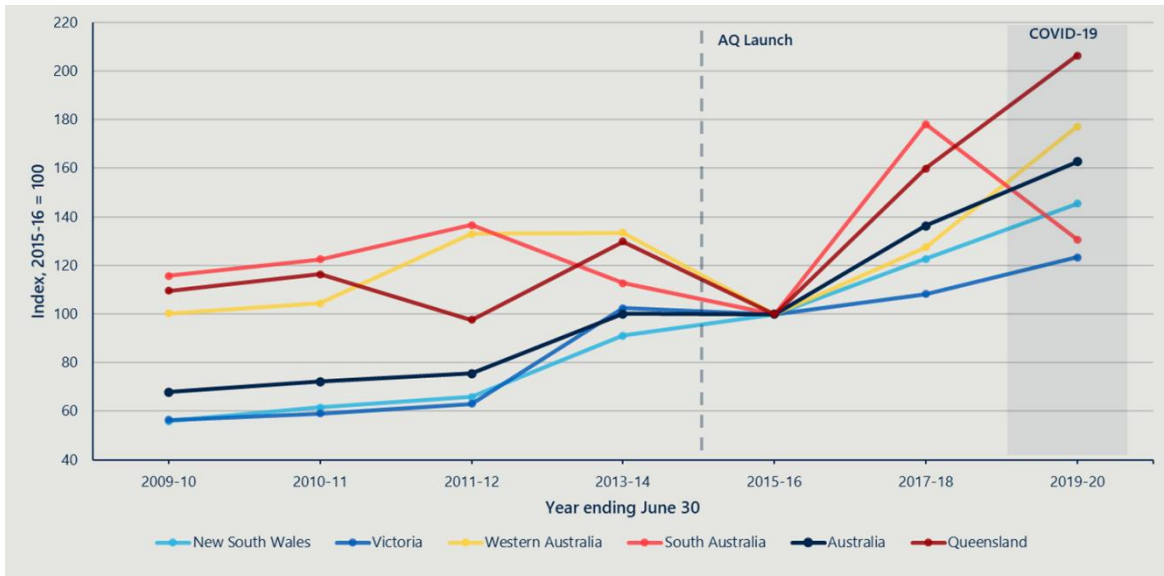


Source: Nous analysis of ABS data

One risk of a major government investment like AQ is that it will ‘crowd out’ (rather than leverage) private sector investment at the macro level (even if some individual AQ grants did leverage private investment). To check for this, Nous examined both private and public investment at the macro level. Alongside the strong increase in GOVERD, Queensland has also experienced strong growth in private business spend on R&D from the 2016 financial year onwards (Figure 34), highlighting that the increased government investment on R&D has not crowded out private business expenditure. Queensland’s BERD has increased by 14.3 percent from 2015-16 to 2019-20, just under Victoria (14.53 percent) but significantly higher than New South Wales, Western Australia and the Australian average (0.40 percent, -32.51 percent and 9.08 percent respectively). To dive deeper into the impact AQ has had on R&D, it is useful to investigate how industries that AQ has focused on have changed their R&D spend. AQ’s key research programs, such as research fellowships and innovation partnerships required industry contribution, and this may be a key part of future programs/investments to keep a momentum on increasing BERD. AQ’s key research programs, such as research fellowships and innovation partnerships required industry contribution and this may be a key part of future programs/investments to keep a momentum on increasing BERD.

Figure 34 shows that the R&D spend by businesses in the Professional, Scientific and Technical Services Industry – one of the innovation-intensive industries highlighted by the Lerner Report – has grown faster than other comparators since the launch of AQ. AQ’s key research programs, such as research fellowships and innovation partnerships required industry contribution and this may be a key part of future programs/investments to keep a momentum on increasing BERD.

Figure 34 | Growth in BERD spend in Professional, Scientific and Technical Services Industry

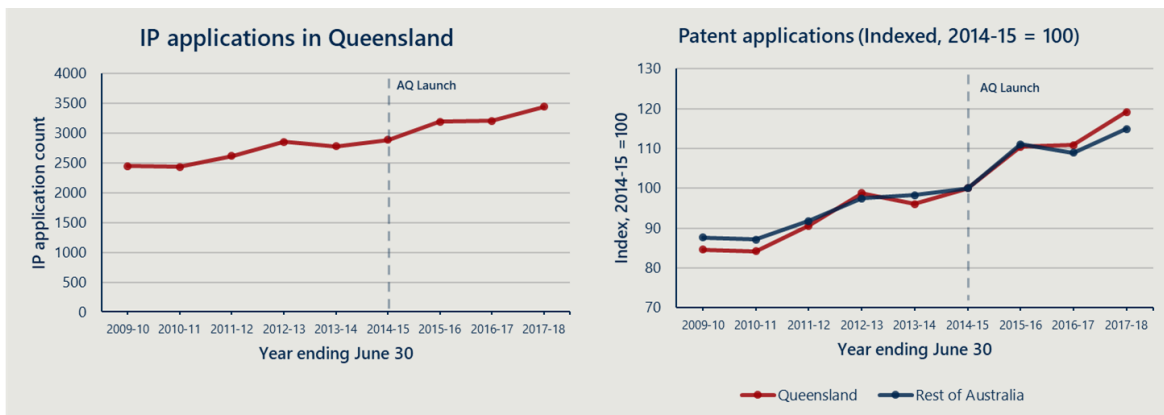


Note: Industry specific data unavailable for international comparators

### Queensland is increasing investment in intellectual property products at lower rate than comparator states, but showing greater productivity than Australian average

Intellectual property products (IPP) are defined by the ABS as the “result of creative activity, R&D, investigation or innovations leading to knowledge that the developers can market or use for their own benefit”.<sup>67</sup> Private gross fixed capital formation of IPP, which can refer to either the creation or purchasing of IPP, has been increasing in Queensland since the 2015/16 financial year, reversing the year-on-year decline that had occurred in the four preceding years (see Figure 35). While investment in IPP has achieved a CAGR of 2.54 percent, Queensland has lagged behind New South Wales, Victoria and the Australian average, which achieved growth rates of 3.84 percent, 4.07 percent and 3.21 percent respectively.

Figure 35 | Queensland intellectual property growth and comparison data



Source: Nous analysis based on Longitudinal Australian Business Integrated Intelligence (LABii) DataVault – QUT

<sup>67</sup> Australian Bureau of Statistics. 2021. 'Australian System of National Accounts: Concepts, Source and Methods'

Coinciding with the positive trend in R&D is the number of patent applications generated within Queensland, which has shown a continual steady growth. LABii data available does not contain number of successful patents, or if they participated within an AQ program<sup>68</sup>. However, it is expected that the targeted AQ audience of innovators and entrepreneurs is likely to have a degree of crossover with patent applicants. The data shows that, since AQ launch, Queensland IP and patent applicants have grown consistently and outperformed the Australian average. This shows that, despite smaller investment growth, Queensland businesses and researchers appear to be more productive in producing patentable innovation than their interstate counterparts.

## Conclusion

Queensland businesses and government have demonstrated strong commitment to increasing investment in R&D, as shown by Queensland outperforming comparator states across government and business R&D investment metrics, as well as attraction of external R&D investments. Additionally, higher than comparator states the number of patent applications suggests high levels of productivity of the research conducted in Queensland.

Venture capital has, on the other hand, grown more slowly than in comparator states. Government funding, and AQ in this case, is an alternative funding source to venture capital, with different decision-making criteria for investment. AQ participants have enjoyed greater access to capital and reported stronger commercialisation outcomes as a result. There is an opportunity to explore how AQ funding could be further leveraged to address gaps in commercial funding mechanisms for innovation, primarily venture capital for better innovation outcomes.

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<sup>68</sup> The Longitudinal Australian Business Integrated Intelligence (LABii) dataset was developed by QUT. The dataset draws on a variety of datasets and is regularly updated. Access is via permission from QUT.

## 4.2.5 Scale for jobs and growth



\* Of mapped programs (see Appendix H)  
Other defined as programs that do not fall neatly into one of the following program types: grant, procurement, partnership, competition or event

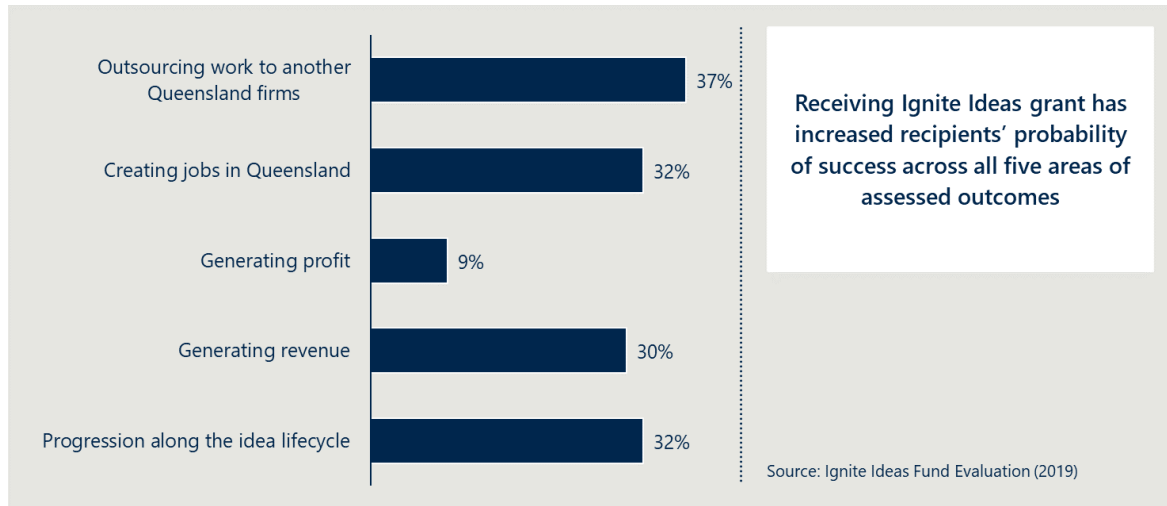
### AQ recipients show strong outcomes flowing from commercialisation of their products and services

An objective of AQ is *Expediting commercialisation*, to increase commercialisation activity, efficiency of commercialisation processes, decrease speed to market and increase value of Queensland products and services.

Initially, aligned with a broad innovation ecosystem growth approach, AQ supported commercialisation outcomes for a broad range of participants. However, more targeted investment was observed as programs were becoming more mature. For example, Innovate Queensland shifted its eligibility criteria to focus more on supporting innovators that have progressed along the innovation pipeline further than initial idea stage. This shift of focus also means that jobs and profit impacts may be more immediately visible, rather than the 5+ year timeframe for seeing impacts of the investments, if investing into early-stage ideas and capability building.

Ignite Ideas is a flagship program aimed at supporting startups and small to medium Queensland businesses to commercialise market-ready innovative ideas, products, processes or services. Through the program, Queensland Government committed \$45 million across more than 360 businesses in the first seven rounds of Ignite Ideas, with strong outcomes for participants. Based on a 2019 evaluation of the first four rounds, the program increased the probability of success for recipients across a number of areas (see Figure 36).

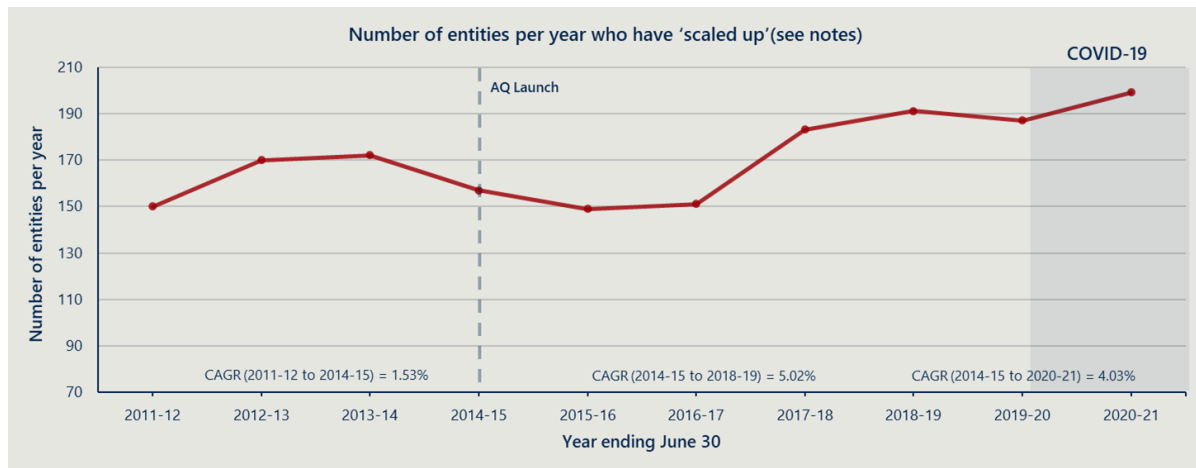
Figure 36 | Increase in probability of success after receiving Ignite Ideas grant



**Queensland scale-ups have been growing at much higher growth rate post-AQ (CAGR 5.02%) then pre-AQ (CAGR 1.53%)**

One of the leading indicators of future growth in jobs, profit and productivity is a growth in scale-ups, in this context and for the purposes of the evaluation defined as entities that have newly exceeded \$10 million in payroll. Broadly speaking, this shows firms that had fewer than about 100 FTE Queensland staff and grew or 'scaled up' to have more than 100 Queensland staff for the first time in that year. Figure 37 shows Queensland has had a strong and sustained growth in scale-ups, with a significant difference between pre-AQ CAGR of 1.53 percent and post-AQ CAGR of 5.02 percent. This demonstrates that AQ may be contributing to an increased ability of businesses to rapidly scale up, but it is important to acknowledge limitations of estimating what portion of scale-up growth can be attributed to the outcomes from AQ. This is driven by difficulty determining what level of growth was additional to what would have occurred in the absence of AQ.

Figure 37 | Number of entities that have 'scaled-up' their payroll to exceed \$10m for the first time



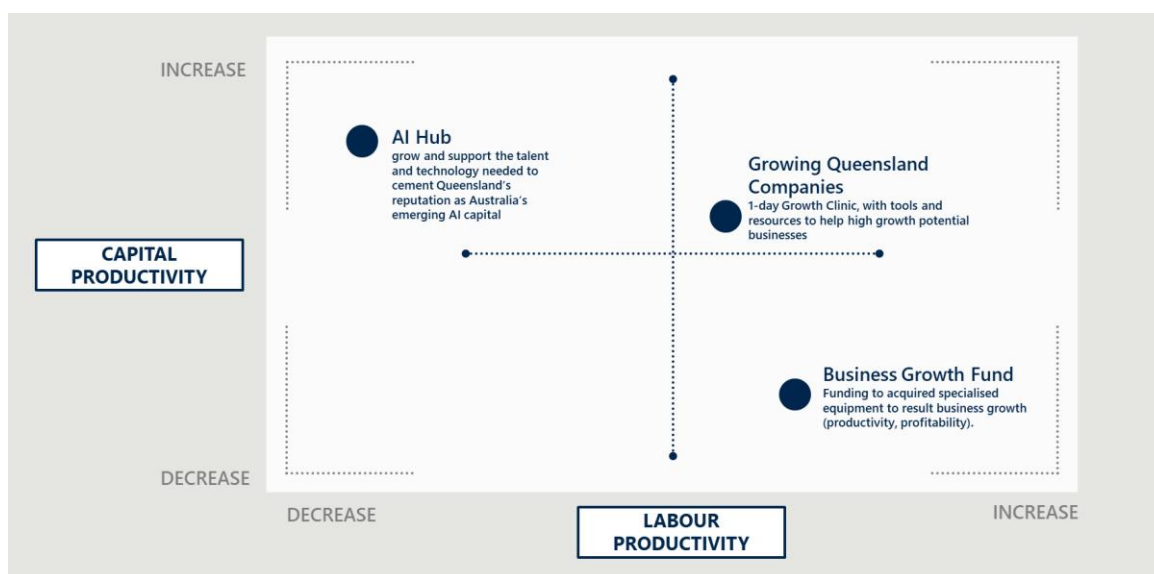
Source: Data processed and provided by Queensland Treasury's office of State Revenue. See appendix for description of methodology.

## AQ has contributed towards growth in productivity

Innovation is a strong driver of productivity. OECD found that innovation investments and their spill over benefits could account for up to 62 percent of labour productivity growth in Australia<sup>69</sup>. Therefore, an uplift in innovation is likely to result in improved productivity over longer term. For the purposes of this evaluation, we are examining three different types of productivity – labour, capital and multifactor productivity (as a combination of the other two with some adjustments).

Three high value programs that contribute to Scaling for Jobs and Growth strategy have been shown in Figure 38 to illustrate their expected impact on productivity. The figure shows that each of the programs examined contributed to increased capital, labour or both types of productivity. Business Growth Fund, for example, enabled businesses to purchase specialised capital equipment, thus decreasing capital productivity, which in turn helped increase their profitability, increasing labour productivity.

Figure 38 | Example of impact of a selection of high value AQ programs on productivity

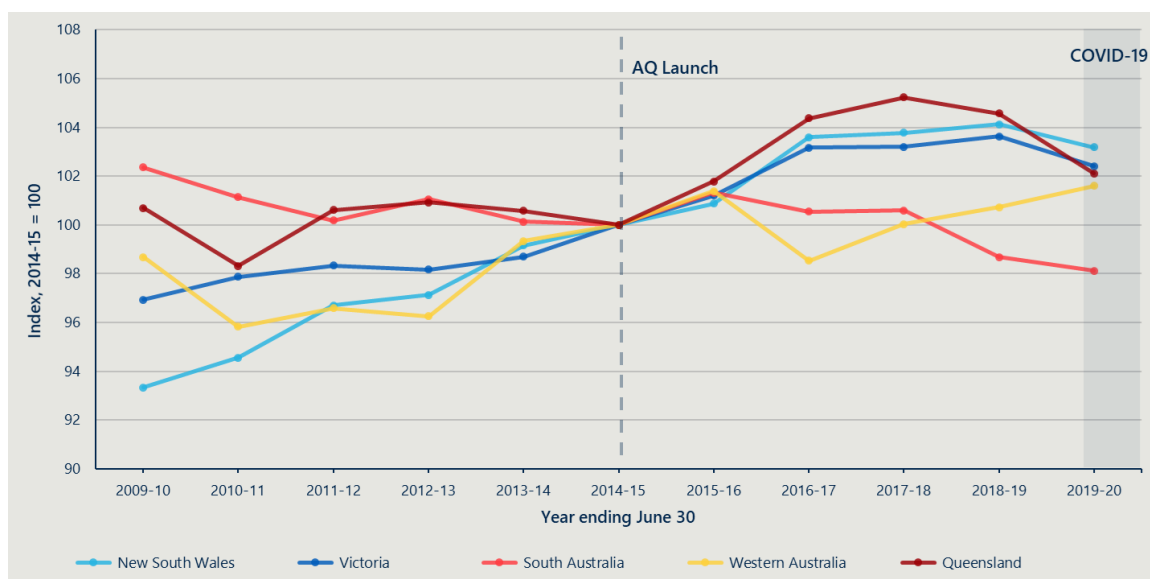


This is consistent with improved productivity reported by survey respondents which found that 98 percent of AAQ participants increased their productivity due to their involvement, of which 44 percent indicated a moderate or greater increase in benefit.

State-by-state comparison of multifactor productivity (MFP) shows that Queensland has shown strong growth in productivity since the introduction of AQ, only decreasing in 2019-20, likely due to COVID-19 (see Figure 39). This growth trend was higher and more consistent than other comparator states, with Victoria and New South Wales showing modest growth, Western Australia oscillating and South Australia declining. This means that when examining a combination of labour and capital productivity, Queensland performed better than other states, with AQ programs aimed at increasing one or both being likely some of the contributors to this outcome.

<sup>69</sup> Australian Innovation System Report (2011)

Figure 39 | Multifactor productivity comparison, index 2014-15 = 100



Source: Nous analysis based on ABS 5260.0.55.002 Experimental Estimates of State Multifactor Productivity, Australia

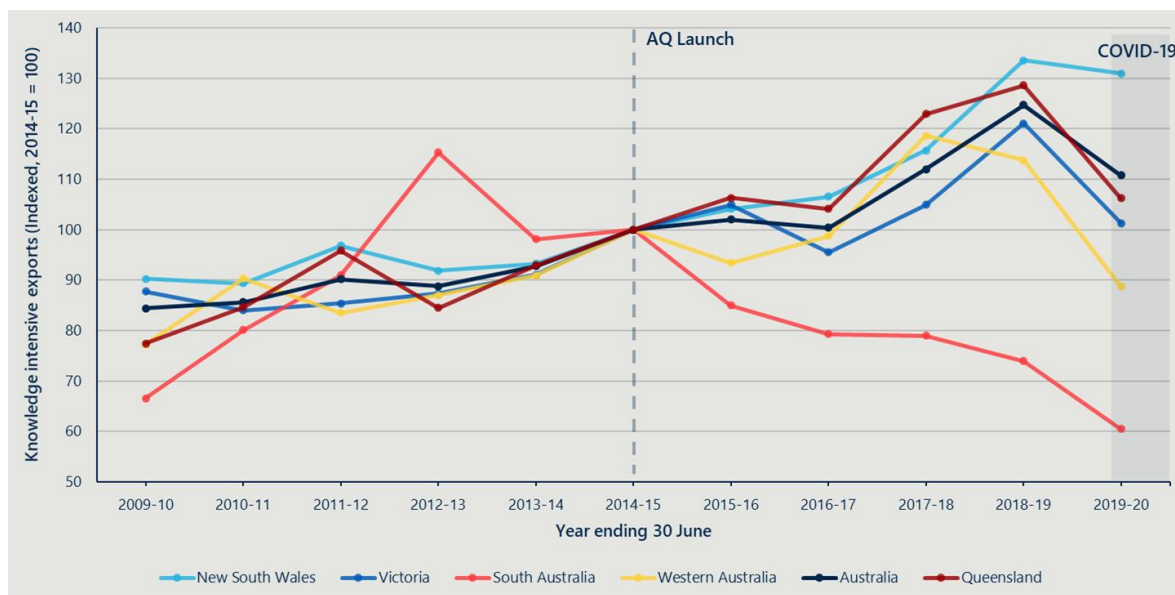
### Knowledge intensive exports showed strong growth up until COVID-19

The amount of Queensland’s knowledge-intensive exports has grown since AQ (see Figure 40). Up until COVID-19, this growth was second only to New South Wales. Due to the nature of exports, it’s hard to assess which portion of this change should be attributed to AQ. Regardless, these figures show strong commercialisation opportunities for the innovation ecosystem in Queensland.

However, granular data on services exports is harder to get than data on goods exports. Many innovative knowledge exports are in the form of advisory services (such as professional and technical services sold to customers overseas) rather than exports of physical manufactured goods. While ‘knowledge exports’ is generally considered one of the key indicators of knowledge economy performance, the data only covers a small part of exports (essentially widgets, not services) that might be considered knowledge intensive. Similarly, measures of ‘economic complexity’ which are based only on goods and not services exports are of little value.

AQ had a positive impact on export outcomes for its participants, as demonstrated through the participant survey. 82 percent of AQ participants reported increased exports as a result of their participation in AQ, in comparison to only 70 percent of non-participants. There is an opportunity to continue to consider export potential when identifying and planning development of priority industries, focusing on what Queensland and its specific regions could do better and more innovatively than anyone else in the world. This may include, for example, innovations coming from Queensland’s leading expertise in disaster management, environmental management and agriculture.

Figure 40 | Knowledge intensive exports, index 2014-15 = 100



Source: ABS and Queensland Treasury, supplied by DTIS. Definition of knowledge intensive provided by DTIS and Trade and Investment Queensland.

## Conclusion

Innovation, when successful, leads to a wide range of other economic benefits – including job creation, increase in exports and business productivity (noting that all of those are reflected in aggregate GSP, so are not additional to the GSP impacts, but rather help to unpack those impacts into its components). AQ played a part in Queensland displaying strong performances across all of those metrics.

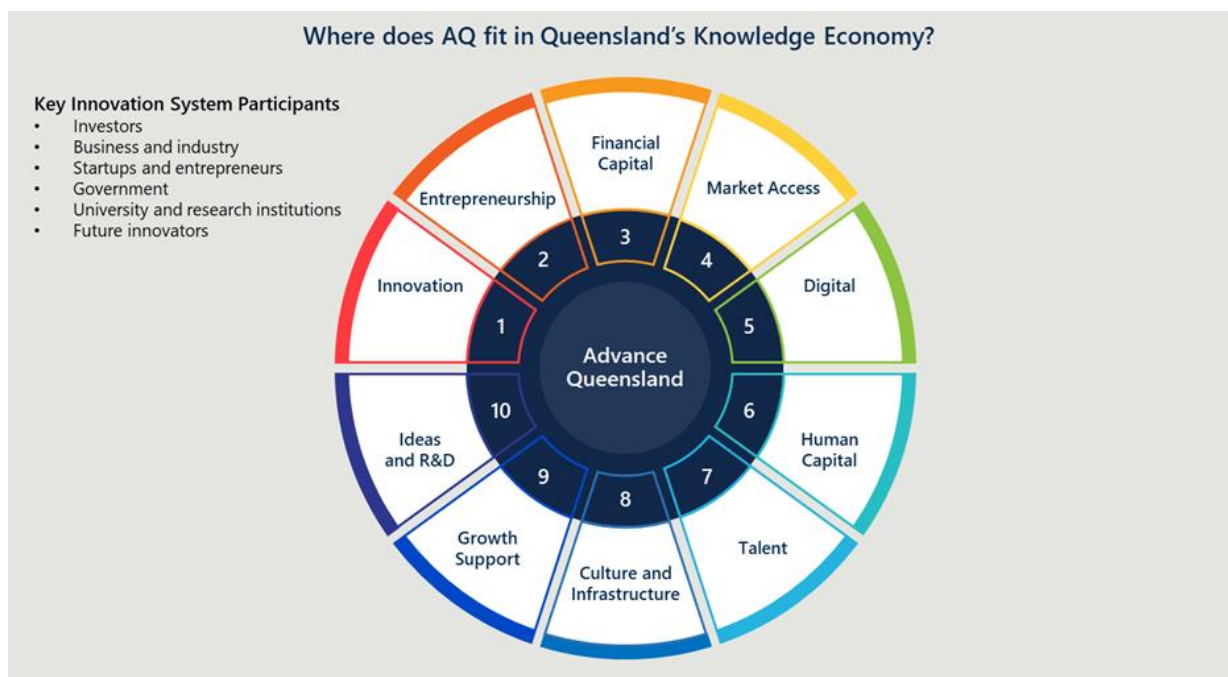
The number of scale-ups is often used as an indicator of future growth in jobs, profit and productivity. Scale-ups had a much higher growth rate since the introduction of AQ than before AQ, based on a novel analysis of Queensland payroll tax data, which Nous developed for this evaluation. We suggest monitoring this indicator in the future. Queensland has also been outperforming comparator states in multifactor productivity and export growth, showing that strong jobs, revenue and productivity outcomes reported by AQ participants are likely translating to the wider economy.



## 4.2.6 Building the knowledge economy

Overall, the AQ initiative is one of many activities in Queensland that contribute to building Queensland’s knowledge economy (refer to Figure 41 below). Knowledge economies are defined as those ‘economies which are directly based on the production, distribution and use of knowledge and information.’<sup>70</sup> In this economic view, knowledge is another factor of production that supports those of labour, land, capital and materials. Closely associated with knowledge is the idea that economies can be successfully grown by spurring innovative practices that are based in technology and science.

Figure 41 | Queensland’s Knowledge Economy



Source: AQ Evaluation Framework (2019), Innovation Division Knowledge Economy Framework (DTIS 2020), Knowledge Economy Framework (DTIS 2015)

To understand how the AQ initiative has contributed towards building the knowledge economy, the evaluation looked at how key whole-of-knowledge economy metrics have trended before, during and after the implementation of AQ (such as knowledge jobs, productivity and knowledge output). Whilst attributing any changes to AQ is difficult, innovation is a key factor in driving the growth of the knowledge economy. According to the OECD, innovation in its various forms accounts for a substantial share of economic growth across its member countries – often around half of total Gross Domestic Product (GDP) growth over the long term.<sup>71</sup>

Given that there are no agreed national or state definitions of what the knowledge economy is, a working definition was developed for the purposes of this evaluation with input from Queensland Treasury (QT), Department of State Development, Infrastructure, Local Government and Planning (DSDILGP) and Department of Tourism, Innovation and Sport (DTIS) (see Appendix D1.1 for full details of the definition and the methodology).<sup>72</sup> It is important to note that innovation happens in all sectors, not just those traditionally considered as knowledge sectors (e.g. IT sector).

<sup>70</sup> OECD. 1996. 'The Knowledge-Based Economy', *STI Outlook, Paris: OECD*

<sup>71</sup> Department of Industry, Innovation and Science; Office of the Chief Economist: [Australian Innovation System Report \(2017\)](#)

<sup>72</sup> For the purposes of the evaluation, a detailed statistical definition (i.e. taxonomy or concordance) of what constitutes the 'knowledge' economy/jobs did not exist (although the general concept was described). Therefore, we defined a proxy measure of the knowledge economy which can be seen in the appendix.

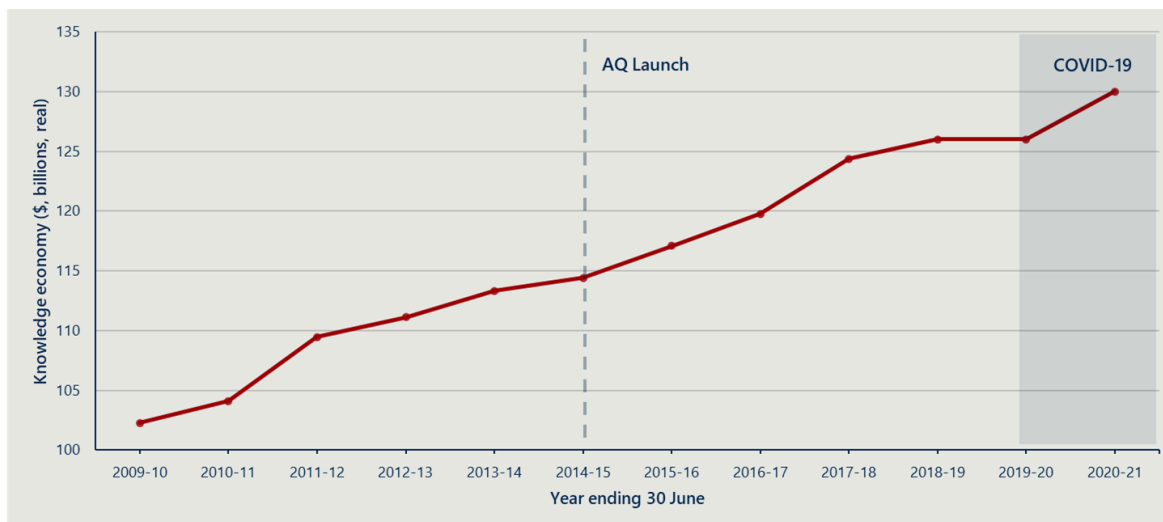
For the sake of analysis, the mining sector has largely been excluded, although this is not to downplay the role the mining sector should play in the future Queensland economy. It was removed because otherwise it would largely distort trends due to its size and changes in resource prices over the last decade.

### The size of Queensland’s knowledge economy has increased since the launch of AQ

Overall, the knowledge economy in Queensland has shown consistent and steady real growth since 2010 (see Figure 42). The size of the knowledge economy measured through the Real Gross State Product (GSP) was valued at \$114 billion in 2014-15 and \$130 billion in 2020-21. The growth in the knowledge economy was trending upward prior to AQ, suggesting that previous knowledge economy-focused initiatives such as Smart State may have also influenced the trend seen post AQ launch. It is difficult to directly attribute the continuation of this growth solely to AQ as there are other activities both in government and private sector (outside of AQ) that also contribute to growing Queensland’s knowledge economy.

The performance of the Queensland knowledge economy has largely mirrored that of the rest of the economy since 2010, although in 2019-20 and 2020-21 the knowledge economy showed smaller decrease from COVID-19 and a larger rebound the following year (see appendix for graphs). This may speak to the resilience of the knowledge economy to external market shocks such as lockdowns because knowledge workers are more likely to be able to work virtually from home and therefore more likely to continue with business as usual. It is noted that the growth in the rest of economy is largely due to the resources boom of the previous decade and large mining and resources sector in Queensland.

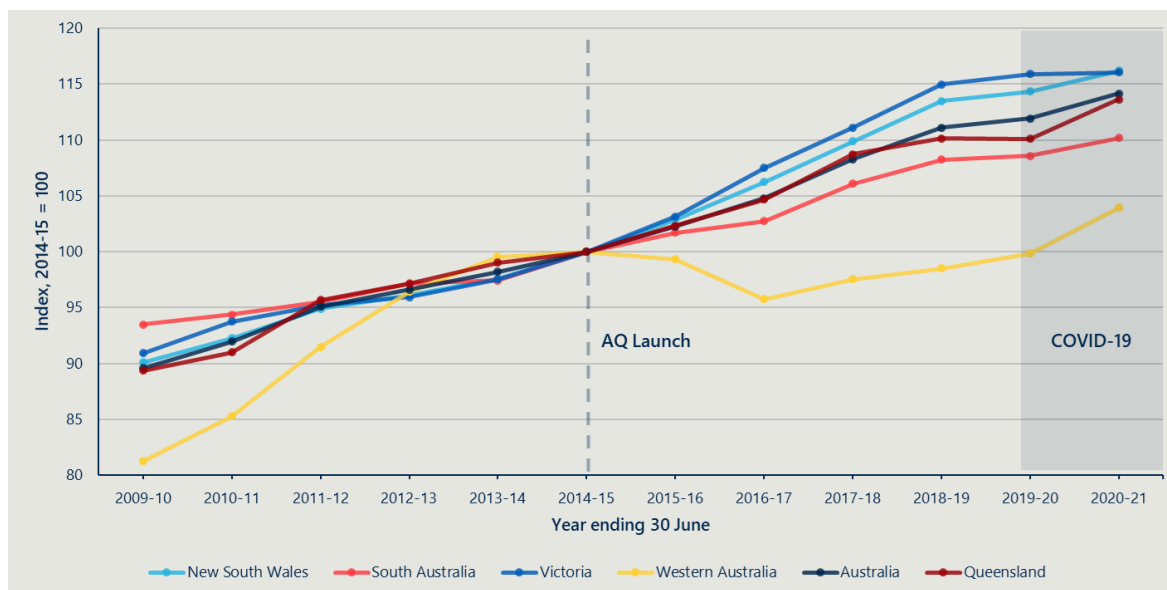
Figure 42 | Real GSP of the knowledge economy in Queensland



Source: Nous analysis using knowledge economy weights based on ANZSIC and ANZSCO, applied to chain volume measures of ABS state accounts 5220.0. Note that GDP represents the industry value add for industries, as does not include product from Other Dwellings, taxes less subsidies on products, or statistical discrepancy.

In comparison to Western Australia, which has a similar economic focus on resources, Queensland’s knowledge economy growth is impressive (see Figure 43). It is important to make this comparison because Queensland is pursuing a unique trajectory among states by growing both its resources sector and its knowledge-based sectors. Although Queensland’s growth in the knowledge economy has been outpaced by New South Wales and Victoria (in terms of year-on-year change), this is likely due to their less ‘traditional’ (mining and agricultural) economic footprints.

Figure 43 | Real GSP of the knowledge economy comparison (index, 2014-15 = 100)

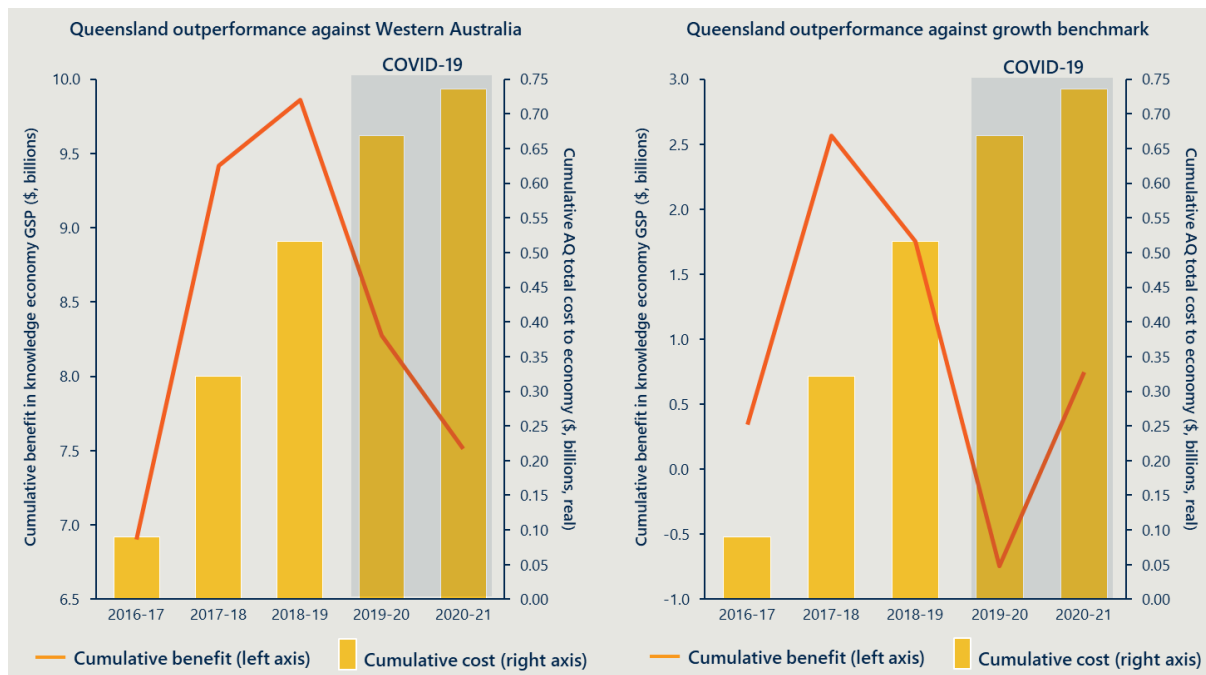


Source: Nous analysis using knowledge economy weights based on ANZSIC and ANZSCO, applied to chain volume measures of ABS state accounts 5220.0. Note that GDP represents the industry value add for industries, as does not include product from Other Dwellings, taxes less subsidies on products, or statistical discrepancy. This may speak to the resistance of the knowledge economy to external market shocks such as lockdowns.

It is useful to compare the change in knowledge economy GSP to two comparator groups: Western Australia and underlying growth in Australia as a whole. Western Australia provides a useful comparison because it has an economic focus on resources (similar to Queensland), and it lacks a serious investment in innovation and the knowledge economy (unlike Queensland). Therefore, it represents the closest approximation to what the Queensland economy may look like without AQ. Whereas comparing against underlying growth effectively sets a benchmark against which Queensland’s figures can be compared.

The analysis shows that against Western Australia, Queensland’s knowledge economy has grown drastically since the start of AQ (see Figure 44). The benefit is likely too large to attribute to the \$755m investment of AQ but regardless, it shows a promising trend. The same can be said for the comparison against a growth benchmark of underlying real growth of two percent. (However, although 2019-20 GSP outperformance dramatically decreased, this is likely a result of COVID-19 as this has reversed in 2020-21.) The two percent real growth benchmark is a retrospective KPI that Nous created. This was required because no benchmark rate of knowledge economy growth had previously been established. Two percent was inferred from underlying trend growth across other jurisdictions and in Queensland prior to 2015.

Figure 44 | Cumulative benefit in knowledge economy GSP mapped against cost<sup>73</sup>



Source: Nous analysis using knowledge economy weights based on ANZSIC and ANZSCO, applied to chain volume measures of ABS state accounts 5220.0. Note that GSP represents the industry value add for industries, as does not include product from Other Dwellings, taxes less subsidies on products, or statistical discrepancy. To calculate performance against Western Australia the difference in growth rates in Queensland and Western Australia for each year was calculated.

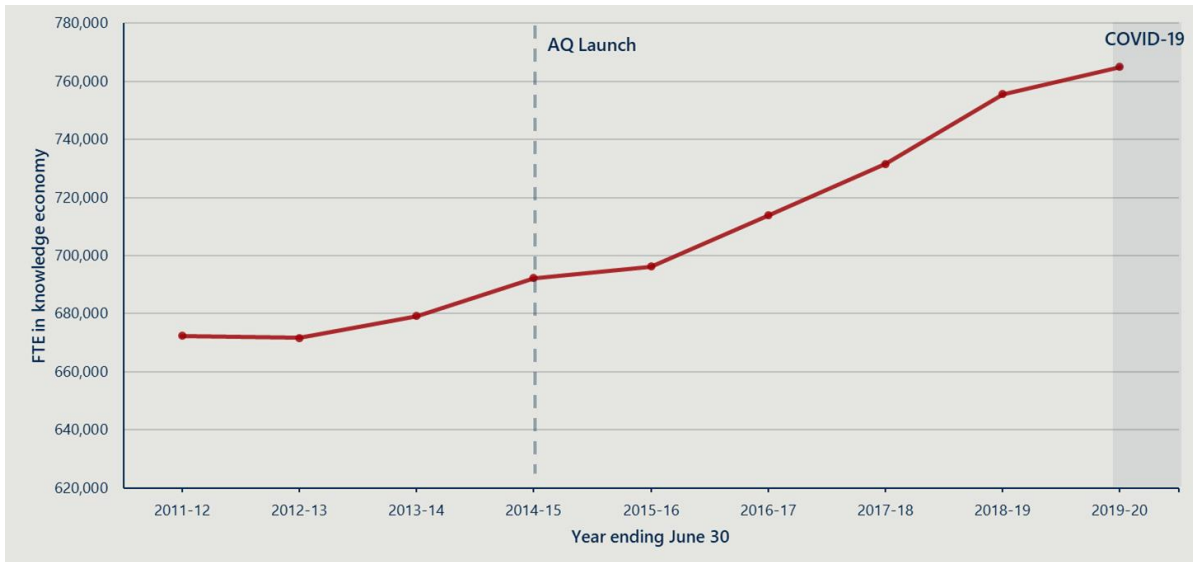
### The number of knowledge jobs in Queensland has rapidly increased since AQ

In terms of knowledge jobs, Queensland has performed well since the launch of AQ (see Figure 45). Analysis using BLADE dataset shows that knowledge jobs have seen a significant increase between 2014-15 and 2019-20 (~72,000 additional FTE jobs, a 10.5 percent increase). This trend appears to have significantly increased since the launch of AQ, although many other government programs and market conditions are likely to affect uptake of jobs so not all benefit can be attributed to AQ (see Other Graphs in Appendix H for FTE comparison against unweighted economy).<sup>74</sup>

<sup>73</sup> These graphs show the difference in growth (the outperformance) between Queensland's knowledge economy GSP growth and WA's and Queensland's growth benchmark (2%). The charts show the cumulative growth/benefits (above each comparator rates) against AQ costs.

<sup>74</sup> Note this definition of FTEs is different to the number of jobs reported to have been supported as a direct result of AQ.

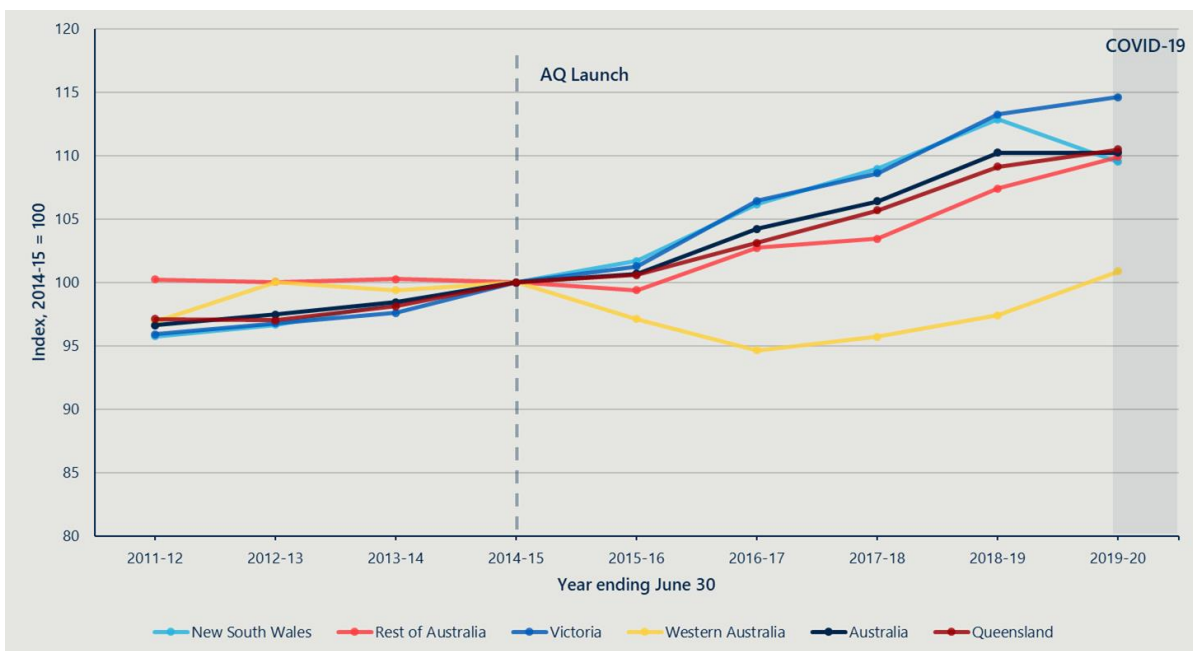
Figure 45 | Knowledge economy FTE in Queensland



Source: Nous analysis using BLADE extracts provided by the Department of Tourism, Innovation and Sport. Figures were calculated by applying knowledge industry weightings to FTE counts of businesses.

The growth in FTE is far ahead of Western Australia, and in line with New South Wales and behind Victoria (0.87 percent, 9.3 percent and 14.6 percent respectively, see Figure 46). This growth is also supported by an increase in the average wage per knowledge economy FTE since the launch of AQ (knowledge economy wage growth has outpaced the Australian average since 2018-19, as calculated from BLADE data; see Other Graphs in Appendix H for wage growth graphs).

Figure 46 | Knowledge economy FTE comparison, indexed 2014-15



Source: Nous analysis using BLADE extracts provided by the Department of Tourism, Innovation and Sport. Figures were calculated by applying knowledge industry weightings to FTE counts of businesses.

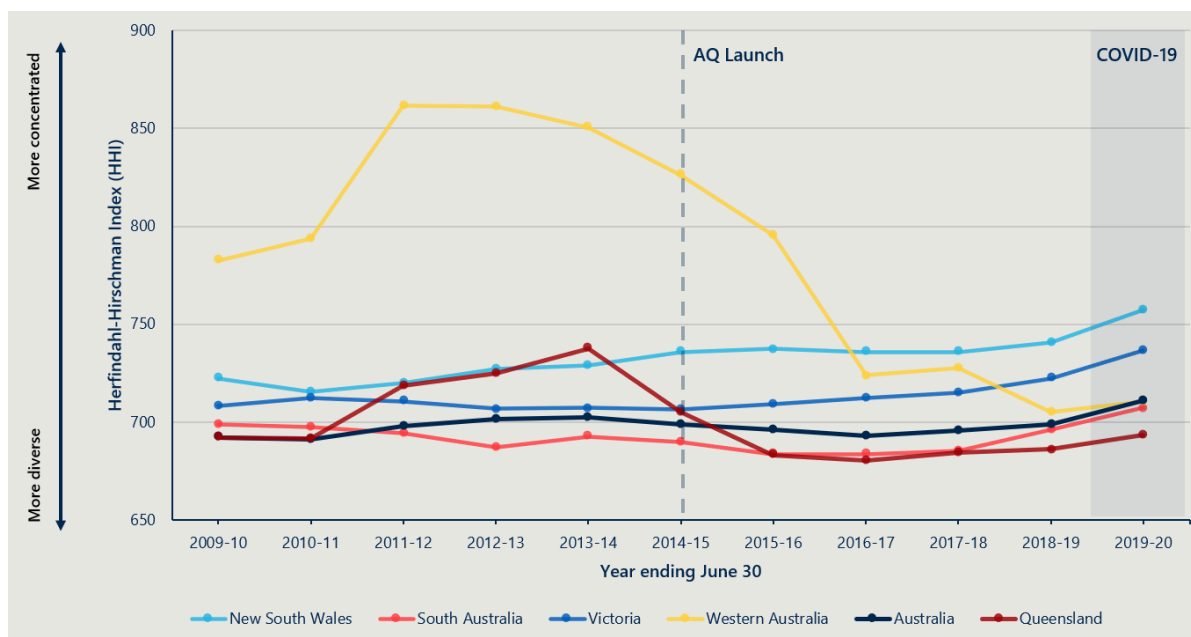
## AQ is supporting the diversification of Queensland's economy

The growth of the knowledge economy through AQ is supporting Queensland's economy to be more diverse. Although mining has continued to grow because of a resources boom, non-mining knowledge economy sectors, have also grown in parallel. This is particularly noticeable for Professional, Scientific and Technical Services, and Information Media and Telecommunications sectors.<sup>75</sup> Once mining is removed, Queensland's Herfindahl-Hirschman Index (HHI) since AQ's launch has trended in a direction that suggests increased economic diversity (see Figure 47).<sup>76</sup> HHI is a measure of market concentration. A higher HHI suggests economic activity is more concentrated in a small number of sectors. Western Australia mining sector growth appears to be crowding out other sectors, reflected in Western Australia's lower performance on many knowledge economy metrics.

These trends are positive for Queensland, although given the size of Queensland's economy all this change cannot be attributed to AQ. A mining boom can cause a 'resource movement effect' where labour resources move to the booming sector, driving up wages for non-mining sectors, which may be what is happening in Western Australia. The demand created by mining, crowding out activity in other sectors, did not appear to happen in Queensland, unlike Western Australia.

Note, given Queensland's strengths in the resource sector it is important to grow it alongside other areas of the economy. Innovation is good for the Queensland economy regardless of what sector it happens in. Considering that an objective of AQ is to drive innovation for growth, the tandem growth in mining and non-mining sectors suggests that this objective is being achieved.

**Figure 47 | Comparison of economic diversity as measured through Herfindahl-Hirschman Index (HHI) mining excluded**



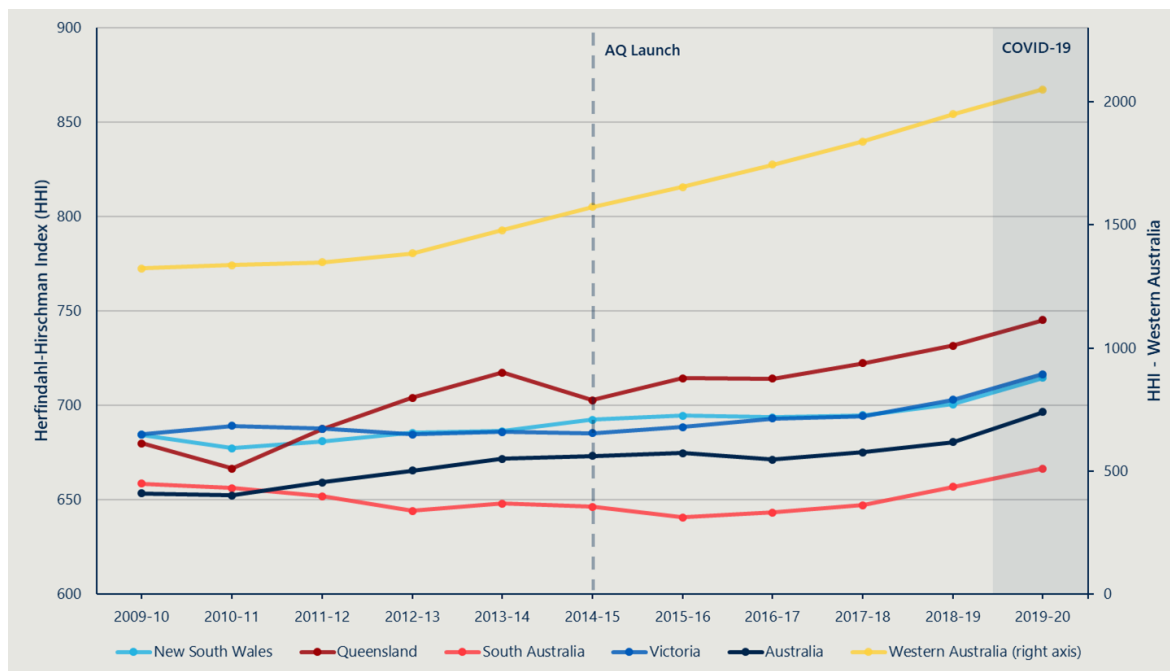
Source: Nous analysis using knowledge economy weights based on ANZSIC and ANZSCO, applied to chain volume measures of ABS state accounts 5220.0.

When mining is included in the calculation to determine HHI, it is evident how much more concentrated Western Australia has become compared to Queensland (see Figure 48). While Queensland's HHI is relatively close to the other comparator states, Western Australia's is approximately three times greater in 2019-20. This means economic activity is more highly concentrated in a small number of sectors.

<sup>75</sup> Both sectors that received AQ funding that was larger than what you would expect given their size relative to Queensland's GSP, and both sectors the Lerner Report defined as central for Queensland's Knowledge economy.

<sup>76</sup>

Figure 48 | Comparison of economic diversity as measured through Herfindahl-Hirschman Index (HHI) mining included (note Western Australia is on the right axis)



Source: Nous analysis using knowledge economy weights based on ANZSIC and ANZSCO, applied to chain volume measures of ABS state accounts 5220.0.

## Conclusion

Analysis of Queensland’s knowledge economy (noting that working definition didn’t exist and was developed for the purposes of the evaluation) indicates that AQ may have partly contributed to Queensland’s impressive knowledge economy performance, with increases in Gross State Product (GSP), businesses growth opportunities, employment and wages. While the economy became slightly less diversified over the lifetime of AQ, it was during a period where mining was also growing strongly and other jurisdictions like Western Australia, with a similar economy, became somewhat less diversified. Relatively speaking, Queensland maintained a somewhat more diverse economy over that period than comparison jurisdictions.

The real GSP of the knowledge economy in Queensland grew by 2.15 percent per annum, from 2014-15 to 2020-2-1 (see Figure 42). This was a higher rate of growth than the Queensland economy as a whole, which grew by 1.83 per cent over the same six-year period. Due to the scale of the AQ investment, of \$755 million, relative to the knowledge economy of \$130 billion per annum, AQ is not the only factor that would have contributed to this performance, noting that the Commonwealth also funded innovation and entrepreneurial programs over the same period.

Table 4 | Opportunities to maximise effectiveness

Opportunity	Supporting findings and details
<p>5. <b>It is important for the government to regularly invest in broad-reaching programs to maintain strong culture of innovation and entrepreneurship, and awareness of these initiatives</b></p>	<p>After an initial spike of interest and engagement in innovation and entrepreneurship in the years following the launch of AQ, the evaluation found that the interest and profile of AQ has since dropped off. Sustained and broad interest in, and engagement in, innovation and entrepreneurship is critical, as it represents the first phase of the ‘innovation pipeline’. This means that underperformance at this stage will carry forward, ultimately negatively impacting achievement of overarching outcomes – diversified economy, increased productivity and job creation.</p> <p>To ensure that AQ, innovation and entrepreneurship maintain their profile, the Queensland Government should maintain momentum through regular investment in broad-reaching programs that build a culture of innovation and entrepreneurship, accompanied by promotion of new and ongoing initiatives and communication of program outcomes.</p>
<p>6. <b>More programs and funding should focus on talent development and supporting pathways to knowledge industry careers, including and beyond STEM</b></p>	<p>AQ’s building capability strategy was a small portion of overall funding, and this is an area where Queensland’s performance consistently lags behind comparator states. Government needs to invest more in building the pipeline of talent, starting from ‘future innovators’ in schools and through to universities and undergraduate and postgraduate levels.</p> <p>While STEM subjects are associated with innovation and entrepreneurial activity, there is also a need for more talent in commercialisation, which needs skills in commerce, marketing, sales and corporate finance (primarily gained through post-school education).</p> <p>Finally, increased exposure to entrepreneurial career pathways is critical for generating interest and increasing talent in the sector. This could mean having entrepreneurs in residence at schools and universities or utilising hubs and innovation places for student placements.</p>
<p>7. <b>Introduce incentives and mechanisms for deep reciprocal engagement between industry and research, including commercialisation</b></p>	<p>The amount of industry collaboration among Queensland researchers has increased but remains low by international standards. Research and consultations highlight that the root cause for this is misalignment of incentives for research and industry to collaborate.</p> <p>This is a well-established and complex problem that is being addressed across all levels of government. However, Queensland Government could consider:</p> <ul style="list-style-type: none"> <li>• Facilitation of more efficient connections between researchers and entrepreneurial organisations, including through incubators, accelerators (working on real issues as suggested by industry) and clearinghouses connecting researchers with real problems that industry needs to solve.</li> <li>• Co-funding prestigious industry fellowships co-funded with industry for academics at various career stages – post-doctoral,</li> </ul>



Opportunity	Supporting findings and details
	<p>professorial etc – which includes funding to the individual academic and their institution (to employ relief lecturers).</p> <ul style="list-style-type: none"> <li>• Funding and recognising importance of career pathways that include both university research and industry experience to facilitate flow of talent between the two sectors, for example as members of a collaborative research project or through part-time postgraduate study.</li> <li>• Funding support for collaborations initiated by the industry that demonstrate clear need for research input; and are backed by evidence of anticipated strong commercialisation outcomes.</li> <li>• Entrepreneurial doctorates in which students develop, iterate, market etc a genuine ‘product’, while simultaneously researching and publishing on the process of doing in the relevant market or industry, and identifying gaps and opportunities they experienced and that other entrepreneurs may also experience. The skills and knowledge developed would have currency in academic, industry and government, and their ‘product’ could have also demonstrated commercial value.</li> </ul> <p>Collaborations should be initiated by the participants (for example two companies, or an academic and council), rather than the government, and seek to drive progress where interests are aligned and complementary.</p>
<p><b>8. Complement ‘physical’ innovation infrastructure with necessary information systems and operational funding within innovation places</b></p>	<p>AQ has supported development of a number of valuable precincts and hubs, including The Precinct, AI Hub and AgTech Hub. There is an opportunity to ensure ongoing benefits of the physical infrastructure through:</p> <ul style="list-style-type: none"> <li>• The systematic use of customer relationship management (CRM) to capture details of participants and encourage them to return and bring other participants.</li> <li>• Secured ongoing operational funding to hubs and innovation centres, particularly in regional areas, without which running of the equipment and infrastructure, as well as facilitation of programs and events are not sustainable.</li> <li>• Established KPIs (including for outcomes across all five AQ strategies) and regular evaluations to understand opportunities to further increase outcomes, in turn, increase return on investment on the infrastructure.</li> </ul> <p>Queensland Government is currently conducting public consultations to determine its Innovation Precincts and Places strategy, outcomes of which will likely provide further information and help influence Queensland’s approach and policy around innovation places.</p>
<p><b>9. AQ funding has an opportunity to complement VC funding and/or channel funding into important</b></p>	<p>In considering role of AQ funding as compared to venture capital (VC) funding, there is an opportunity to identify gaps in VC funding and channel funding into important opportunities that fall outside of VC. This might mean:</p>

Opportunity	Supporting findings and details
<p><b>opportunities that fall outside of VC funding</b></p>	<ul style="list-style-type: none"> <li>• Supporting high-potential innovations in early stages of commercialisation, before market potential has been proven.</li> <li>• Supporting innovators located outside of large urban hotspots.</li> <li>• Investing into and supporting established SMEs to obtain and access further funding.</li> </ul>

#### 4.2.7 Case Studies on priority cohorts (subsequent pages)

# CASE STUDY Enabling Aboriginal and Torres Strait Islander innovators and enterprises

## OVERVIEW

The Deadly Innovation Strategy (DIS) was designed to strengthen participation and performance of Aboriginal and Torres Strait Islander innovators and entrepreneurs and in doing so, growing and sharing economic and social inclusion.

The DIS was codesigned by the Department of Innovation, Tourism, Industry Development and the Commonwealth Games, the Aboriginal and Torres Strait Islander Business and Innovation Reference Group (BIRG) and key stakeholders to respond to the structural barriers facing promising Indigenous innovators and businesses.

Since 2017 the Deadly Innovation Strategy and fund has grown from a tiny footprint to a mature and complex program, with 21 separate elements including Deadly Deals, PhD scholarships, engagement visits to regional and remote communities, a community governance wealth-sharing model, a community call centre, and business connection services. This breadth and diversity reflects the fact that while DIS is primarily aligned with the Supporting Culture strategy, it also contributes to the other four AQ strategies as well – and is an innovative approach in and of itself.



Photo: Deadly Innovations Wattleseed Go Live event. More details on this initiative on the next page

### Deadly Innovation Actions to enhance inclusion, economic growth and social benefits



#### HEAR

- Access Aboriginal and Torres Strait Islander leaders for advice.
- Analyse the current program offerings.
- Promote Aboriginal and Torres Strait Islander businesses and innovation.
- Establish pathways to success for Aboriginal and Torres Strait Islander businesses and innovators
- Create digital futures for Indigenous people and communities.



#### SHARE

- Support platforms for Aboriginal and Torres Strait Islander businesses and innovators to connect to jobs and opportunities.
- Enhance the likelihood of Aboriginal and Torres Strait Islander businesses and innovators to succeed in applying to existing government programs.
- Enliven networks to maximise opportunities.



#### ACTIVATE

- Improve economic independence in the sectors of: Agriculture/aquaculture; Energy, renewables and telecommunications; Construction; Defence; manufacturing; Government services; Arts and culture.

## DISTINCTIVE FEATURES

Multiple factors contributed to DIS impact. These can be considered for future innovation strategies:

- **A nimble and responsive approach to developing and adapting programs and grants to maximise positive impacts.** There was a big focus on the development and implementation of bespoke strategies to meet needs of innovators and their enterprises. The team searched for change agents and 'seeds' of ideas, then approached to listen and connect with useful people and grant opportunities, which acted like catalysts. This approach was enabled by the fact the DIS unit was embedded within the central hub of the AQ unit, providing them with good understanding of how the various AQ programs and strategies across various departments came together, and how gaps or opportunities in each program could be leveraged. *It is likely that additional people in the DIS unit could have amplified these benefits without compromising agility and trust which enabled them to be matched with well-suited innovators.*
- **Deep and genuine trust, including cultural trust, was essential to establishing and maintaining productive connections between stakeholders.** This trust came from taking the time to understand the drivers, barriers and ambitions of each enterprise which enabled them to match them with well-suited partners to grow their business. *This investment in time appears to offer a strong return but may not be scalable.*
- **Expansive expertise and networks including through the BIRG.** This group of "passionate and highly connected leaders" was effectively utilised throughout the strategy for their policy advice, niche expertise and connections. A "train-the-trainer" approach to many DIS programs meant that participants were able to then train others in their businesses and communities, further expanding local capabilities and networks across the state.

## CASE STUDY Enabling Aboriginal and Torres Strait Islander innovators and enterprises

### OUTCOMES AND IMPACT

#### A larger and more inclusive innovation eco-system

Following introduction of the DIS, awareness of AQ among Indigenous innovators and businesses grew significantly. For example, Ignite Ideas had only three Aboriginal and Torres Strait Islander applicants in its first three rounds, but now receives more than triple that amount. Overall, 3.6% of AQ recipients were Aboriginal and Torres Strait Islander, which approaches their proportion of the Queensland population (4.1%)

#### Growth of innovative Indigenous enterprises

Through Deadly Deals, nine companies have so far shared a total of \$800,000 and catalytic connections that have seen their enterprises experience significant growth in capability, capacity and markets. These businesses had all been ineligible or unsuccessful for other grant and funding opportunities. The funding and connections provided through Deadly Deals enabled these enterprises to break through structural and financial barriers to growth, with their value subsequently recognised by investors and customers across Queensland, Australia and internationally. See *snapshots below*.

#### Sustained social and economic benefits for communities

The town of Cherbourg has benefited from being put on the international map through a series of Ingenious approaches to waste management led by local leaders and enabled through AQ support. The first major project was the Cherbourg Aboriginal Shire Council's Container Exchange depot and Material Recovery. This has now expanded to include a major artificial intelligence (AI) project, in which 3D cameras identify, sort and count items on the waste conveyor belt, which has garnered the interest and support for expansion. More recently, Cherbourg Council, DTIS and tech-leader Fujitsu signed a letter of intent for the development of a service contact centre at Cherbourg, bringing more digital jobs to the town. These developments were made possible through the Aboriginal Shire Council, Indigenous Land and Sea Corporation, and Noosa Shire Council's Peregian Digital Hub. <https://southburnett.com.au/news2/2021/10/06/cherbourg-aims-for-the-world/>

### IMPACT SNAPSHOTS

**Reckon** – Launched 'Deadly Digits', an online, cloud-based accounting software suite which enables Indigenous enterprises to access sophisticated tools to help digitise operations, bolster productivity and fuel growth. Features include real-time monitoring of day-to-day cash flow, unlimited online invoicing, bank data feeds, payroll and STP reporting for an unlimited number of employees, employee expense management capabilities, Indigenous-first events and training. <https://www.reckon.com/au/media/reckon-launches-deadly-digits-platform-to-provide-digital-edge-for-queensland-indigenous-businesses/>

**Sobah** - A social enterprise making alcohol-free craft beers with native flavours, established by Gamilaroi man Dr Clinton Schultz and his wife Lozen Schultz in 2017. (pictured below) Deadly Deals funding helped them with refrigeration challenges during transportation. Since this game-changing support, they've landed distribution deals with Dan Murphy's and BWS, and achieved their \$1m equity goal 10 days ahead of their deadline after securing 569 eager investors through crowdfunding.

<https://www.smartcompany.com.au/startupsmart/news/equity-crowdfunding-momentum-alcohol-free-beer-sobah-1-million/>

**LOGiT Australia**, an Indigenous software company based in New Farm, used AQ funding to develop a world-first diversity management system. This system (called weavr.) helps businesses and agencies to streamline, centralise and grow their reconciliation journey. Weavr. supports organisations to develop, manage, track and report on their Reconciliation Action Plans (RAPs) and achieve desired outcomes such as:

- Increased Indigenous employment representation
- Increased engagement with Indigenous communities, and
- Increased Indigenous procurement

<https://advance.qld.gov.au/industry/weavr-threads-community-change> and <https://www.weavrsys.com/>

**Woorabinda Aboriginal Shire Council** is working with Greening Australia, Rural and Remote Development Consultants and Advance Queensland Deadly Innovation to create a community owned and operated commercial-scale wattle seed plantation near the Woorabinda township in Central Queensland.

<https://www.greeningaustralia.org.au/new-project-explores-woorabindas-wattleseed-potential/>



# CASE STUDY Breaking down barriers for female entrepreneurs and researchers

## OVERVIEW

Women have historically faced greater barriers when pursuing their innovations or businesses, in large part due to systemic barriers and bias, and a heavier share of unpaid care work. This is reflected in far fewer female-led or co-founded start-ups than male led start-ups, and the lower proportion of capital they access. AQ sought to remove glass ceilings and other barriers through dedicated programs and promotion of broader opportunities to this priority cohort.

Efforts to increase the participation, capabilities and capacity of female innovators, entrepreneurs and enterprises was pursued through two flagship programs (see below) and also through mainstream programs that progressively became more accessible through greater and more targeted investments. Together these efforts primarily aligned the Supporting Culture and Building Capability strategies.



## FLAGSHIP PROGRAMS TO SUPPORT THE PARTICIPATION OF FEMALE INNOVATORS, RESEARCHERS AND ENTREPRENEURS

### Female Founders Program (2019 - 2021)

The Female Founders Program was designed by the Impact Innovation Group to support existing female founders to grow or scale their business through tailored training, connections (including through in-person and online events such as Innovation HerStory), mentoring and social media engagement.

There were four separate Female Founders programs each delivered by a separate provider:

1. **Evolve** - to empower, evolve and escalate women-led businesses located in regional and outback Queensland.
2. **Impact** - deliver capability development activities focusing on confidence, education and skills development.
3. **Advisory Board** - deliver skills and exposure to engage effectively with advisors and to establish best practice governance.
4. **Spark** - provide female led start-ups with 12-months access to mentoring, training and tools to help excel in influencer marketing, brand growth and business scaling.

Between 2019 and March 2021, \$1.07 million was expended supporting 38 recipients, with many more participating in networking and educational events or engaging online and through social media.

### Women's Research Assistance Program (revised from Women's Academic Fund)

WRAP supports women in maintaining their research momentum following approved maternity or adoption leave, and encouraging the retention of female researchers in their chosen profession in Queensland. Funding up to \$26,000 (excluding GST) is available through the program to support the nominated Primary Researcher. This is typically used to employ a research assistant to enable the research to continue.

The WRAP builds on the successful and popular Women's Academic Fund (WAF) which ran from 2015 to 2017.

As at September 2021, more than \$2.68 million had been spent supporting 264 participants:

- WRAP: \$1.036 million supporting 119 recipients
- WAF: \$1.65 million supporting 119 recipients.

### Other programs embraced by women

- Mentoring for Growth: 45% women
- Small Business Digital Grants: 37% women
- Small Business Entrepreneur grants: 53% women
- Engaging Science Grants: 70% women
- Innovate Queensland: 47% women
- AQ TAFE Pathways Scholarships: 66% women
- Industry Research Fellowships: 45% women

# CASE STUDY Breaking down barriers for female entrepreneurs and researchers

## OVERARCHING FINDINGS

Evaluations and improved data collection and interrogation enabled more efficient and responsive design, but gaps and systemic barriers remain

- Some female researchers ineligible due to their career stage, research appointment, institution or supervisor.
- Some female founders were ineligible because they had a male co-founder

*“Our business wasn’t pink enough to be eligible, despite having a female majority board and chair.” – Focus group participant*

- Female founders and researchers both spoke of systemic barriers to accessing business capital or research funding, or being viewed of as less capable or reliable by institutions or investors in managing large, long-term projects, despite evidence to the contrary.

**While targeted programs for women are important, access to and inclusion in mainstream programs remains critical**

*“Female specific programs have been great because there are a lot of shared strengths and challenges – like juggling business with family. But the best part of participating in AQ was the connections I made through the broader networking events and programs like Ignite... It’s important not to segregate us from these networking opportunities”.*  
– Focus group participant

**The benefits can be expanded and sustained through practical additions**

The most valuable “missing links” to prolong and extend these benefits are:

- Alumni networks in which program graduates can be volunteer mentors
- Self-paced online courses using IP developed from events and case-studies
- An online portal with a directory of contacts on different issues.



## PROGRAM OUTCOMES AND IMPACT

### Outcomes of the Female Founders programs

**Mentoring and 1:1 delivery produced strong outcomes at higher cost.** These outcomes included high and increasing likelihood of accessing capital (grants or funding), building self-efficacy and contributing to business growth. This impact is attributable to 1:1 program’s ability to tailor to female founders’ strengths, needs and goals, which vary widely. For example, some founders will be interested less in revenue growth, because they seek work-life balance or have a business that is low-risk and secure.

**Webinars and workshops received overwhelmingly positive feedback but demonstrated limited positive impact.** Three factors contributed to this: 1) Many had to pivot from in-person events to online events; 2) Many of the events covered topics available elsewhere, including for free via YouTube; and 3) One-to-many events were less tailored. We also heard one program had limited engagement because the chosen (male) supplier didn’t understand the needs and strengths of the female participants. For example, the innovative approaches some mothers took to juggle business and family was seen as a deficit rather than agile problem-solving.

**A focus on outputs rather than outcomes meant limited visibility of business growth, capability development or uplift in confidence and self-efficacy.** It also meant providers and recipients could have focussed more on “quota-chasing” to demonstrate performance of required activities, rather than productive pursuit of the objectives.

### Outcomes of the WRAP and WAF

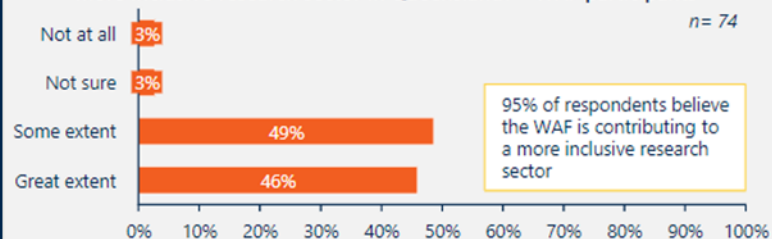
**More women were able to stay connected and progress their research.** The WRAP and WAF filled a critical gap not met by other programs by helping them to maintain research momentum during and after family leave. This contributed to a talent retention and an inclusive research workforce.

*“The benefits of the WRAP in retaining talented staff and research momentum were significantly greater than I expected.” – Survey respondent,*

**This led to new findings, further research projects, and career opportunities that might not have otherwise occurred.**

*“[The WAF enabled me] to complete a pilot study during my maternity leave which provided important pilot data used for a large NHMRC project grant”*  
– Focus group participant

To what extent do you believe that the Women’s Academic Fund has enabled a more inclusive research sector in Queensland? – WAF participants



This case study draws on Nous’ 2021 review of Innovation Partnerships and 2019 evaluation of AQ Supporting Research Programs, in addition to data collected as part of this macro evaluation.

# CASE STUDY Regional programs sparked activity with mixed impacts

## OVERVIEW

### Entrepreneurial businesses and innovators in regional and rural areas face endemic barriers and challenges.

Many of these barriers are inherent to geography (or distance from major centres) such as a lack of social and economy connectivity, lower infrastructure, reduced access to customers, low industry complexity (reliance on one or few industries), a heightened risk of physical disruption from natural disasters such as fires and floods, and (to varying degrees) and greater uncertainty.

However, innovators and entrepreneurs in regional and rural locations face the same challenges as those in metropolitan areas – particularly attracting and retaining talent, and attracting and sustaining capital - challenges which can be exacerbated by their distance from population centres.

Advance Queensland sought to overcome these barriers to infrastructure, connections, capital and mindset through a suite of programs that sought to attract, harness, coordinate and amplify the ingenuity of individuals and businesses in country areas.

### Advancing Regional Innovation Program (ARIP)

ARIP sought to turn Queensland's regions into hubs for innovation and enterprise to strengthen existing industries and prepare regional Queenslanders for jobs of the future. It was designed to enable local entrepreneurs, business leaders and key industries to collaborate closely with each other and with government to harness innovation and unlock business potential.

The program had designated 12 regions each with a \$500,000 allocation (to which each region contributed a matching amount) to spend on activities such as mentoring, capability development and innovation spaces. Each region had to undertake outreach activities to foster innovation across a broader geographic and demographic audience, in at least two locations across the region.

### Other programs specifically targeted to regional and rural areas

- Regional Angel Investors Support Program
- Regional Startup Hubs Support Program
- Regional Startup Onramp Program
- Queensland Connects
- Regional Network Fund collaborative projects
- Office of the Queensland Chief Entrepreneur and regional roadshows
- Regional Futures (commenced July 2021)

This case study draws on Nous Group survey data, focus groups, interviews, DITS data and Research and Insights Note 3 draft *Regional Innovations Programs Review* prepared by DTIS in February 2021

## OUTCOMES AND IMPACT

### Overarching findings

#### AQ programs helped create and extend innovation eco-systems

Investing in regional hubs and leaders supported the rapid advancement of networks and capabilities across Queensland at both local and state levels, especially among small and medium enterprises and local leaders. They are highly valued and maturing at different rates.

"AQ gave us time and opportunities to step out of our spaces and come together, share ideas, network, call someone to get things started."

#### Regional programs and hubs are not all financially sustainable

Hubs and innovation centres, events and services continue to be topped-up with paid and unpaid labour and inputs. Given that research into business and innovation ventures shows results and return on investment can take many years, there is a risk that withdrawing or reducing funding support could see the current and future benefits cease. Continued on-the-ground support is required while these initiatives take root and collaborations evolve. There was minimal evidence of planning for sustainability after the end of AQ funding, which is a pressing concern.

"Through the smart hub and other grants we employed a digital engagement officer, got message out re-establishing ecosystem, breaking down barriers, run programs. But its difficult to measure results. They take time."

#### Small grants and large investments not always well targeted or received

Regional and rural innovators described a "spray and pray" approach in which investments didn't appear to match either greatest need, talent or opportunity. For example, we heard Ignite Ideas grants in regional areas went where they were better at writing grants (or could afford grant writers), rather than those with the best ideas, that the Queensland Connects program was not advertised and its purpose was unclear, and the Hot DesQ offered minimal benefit because there was no extra incentive for teams to choose regional or rural locations far from the city or the coast. We also heard that some hubs displaced private investment, displaced or overlooked effective incumbents, or was spent on initiatives unaligned with local industries and priorities. It is important of understanding the local landscape, knowing the existing leaders and services doing deep community change, and supporting them to respond to the gaps in a way that aligns with the communities overarching strategy.

### ARIP outcomes

ARIP was the most divisive of the eight programs discussed in the regional and rural focus group, with significant positive and negative outcomes described.

#### Positive outcomes

- Greater economic activity directly contributing to new jobs – up to 195 in Townsville alone
- Greater innovation – developing patents and new approaches
- Normalising innovation entrepreneurial activity "ARIP helped us normalise the awareness and conversations around innovation. We have continued on with this work and will keep building on the foundations that ARIP established"
- New and expanded peer-to-peer connections and partnerships
- Greater accountability, deep thinking and deliberateness prompted through application and acquittal processes. "We had lots of learnings in Year 1, and then applied these in years 2-4 and got a more controlled focus. Before they released funds they asked for pitches, applications, programs, and then vetted how the funds were used and delivered, so could effectively acquit the funds. Much stronger governance over time."

#### Negative outcomes

- Unnecessary tension in some areas where there was an absence of local collaborative support structures. In some places, the grants attracted big players who then left, displacing volunteers and local providers who have a deeper understanding of local players, priorities and strengths. In other places, the advantages only went to an exclusive few. "ARIP didn't appear to do much in our region unless you were already in the 'bubble' of the organisation in the main group." "Since ARIP started, everything else stopped. Our region wasn't part of it, because not part of the boys club you needed to be in it."
- A narrow view of innovation that focussed on start-ups and tech. "One of real failings of ARIP early on was that they were very start-up focussed. It took all the oxygen. Innovation should be a normal part of business operations, like continuous improvement and problem solving... This is key to really grooming innovative thinking and activity more broadly."

## 4.3 Performance against strategic priorities

In 2019, the Queensland Government released the *Building Our Innovation Economy - Advance Queensland* strategy (the AQ Strategy) to guide the next phase of the AQ initiative. The AQ Strategy outlines four key priorities in further enhancing the growth of Queensland's knowledge economy, identified through extensive stakeholder consultation:

- **Build on Queensland's Strengths** – create jobs through innovation in our traditional strengths such as agriculture, manufacturing, resources and tourism, and encourage new industries based on our state's assets, like biofutures.
- **Back Our Regions to Compete Globally** – work with regional communities to grow their unique competitive advantage to build industries and create jobs.
- **Scale Up Local Solutions for New Markets** – work together to scale up our entrepreneurs, startups, small-to-medium enterprises (SMEs) and businesses by helping them commercialise ideas, linking them to investors and making global connections.
- **Invest In Science and Technology to Create Jobs** – use science and technology to commercialise research and solve the challenges facing Queensland and the world including climate change, protecting the Great Barrier Reef, and energy and water sustainability.

Key directions were identified for each of the priorities, representing opportunities to achieve growth and create jobs through innovation. The Strategy also included 16 immediate actions, 14 of which have been implemented, and two are on track for delivery (see Appendix F).

Summary of performance analysis against each of the priorities is provided in section 4, 0.

The Strategy lists eleven traditional and emerging priority industries that support growth and knowledge intensive jobs in Queensland:

- Advanced manufacturing
- Aerospace
- Agriculture and food
- Biofutures
- Biomedical
- Defence
- Hydrogen
- Mining equipment, technology and services (METS)
- Screen industry
- Resource recovery
- Tourism

Many of these built upon the "Smart Sectors" identified in the mid-2000s through the Smart Sector Strategy, and were incorporated into AQ in 2015-16, with funding allocated in 2016 develop five 10-year roadmaps and action plans.



Additional priority industries have subsequently been identified by the Government, including the eight knowledge intensive industries identified in 2019 through the “New Smarts”<sup>77</sup> report and a further nine emerging knowledge driven seed industries identified in 2021 in the “A New Chapter”<sup>78</sup> report. Summary of AQ’s performance in supporting development of priority industries is provided in section 4, 0.

### 4.3.1 Priorities in the 2019 AQ Strategy

#### **Build on Queensland’s Strengths: Both emerging and traditional industries benefitted from industry-specific and infrastructure investments, but challenge of pace of adoption of innovation remains**

This priority aims to create jobs through innovation in Queensland’s traditional strengths such as agriculture, manufacturing, resources and tourism, and encourage new industries based on our state’s assets, like biofutures.

##### **Immediate actions delivered under this strategic priority**

- Established a field robotics industry cluster, focusing on mining, defence, agriculture and the environment
- Supported a new AgTech and Logistics Hub in Toowoomba
- Developed Skills Implementation Plan for Advanced Manufacturing.

##### **Summary of evaluation findings**

Evaluation found that traditional industries benefitted from hubs and innovation infrastructure, particularly benefitting when connecting established businesses with innovative solutions, which led to increased awareness and is likely to result in increased adoption of innovation. For example, AgTech and Logistics Hub in Toowoomba facilitates prototyping and showcasing of a variety of solutions; and because it acts as an agnostic hub it is in a position to facilitate genuine connections and set foundations for a strong industry cluster. We heard that establishing clusters works best when built on existing industry connections; and developed in collaboration with companies and researchers that are part of existing networks.

Government support for priority industries, namely development and implementation of priority industry roadmaps helped stakeholders in new and emerging industries gain certainty of government support in the long term, understand government and industry priorities, opportunities and challenges. This, in turn, enabled better planning and investment in innovation in their own businesses.

A challenge remains in **increasing pace of adoption and diffusion of innovation in traditional and well-established industries**, which tend to be slower at adopting innovative solutions and processes. For example, a Deloitte survey of global manufacturing companies found that just 20.7% of manufacturers rated themselves as “highly prepared to address the emerging business models the Fourth Industrial Revolution brings”<sup>79</sup>. The OECD<sup>80</sup> suggests that relevant policy instruments to support this include strengthening workforce and management skills for innovation, accelerating the digital transformation to scale business innovation networks and fostering effective industry-university relationships.

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<sup>77</sup> Naughtin C, Horton J, Pham H. 2019. New smarts: Supporting Queensland’s knowledge-intensive industries through science, research and innovation

<sup>78</sup> Naughtin C, Moyle C, Pandey V, Renando C, Poruschi L, Torres de Oliveira R, Doan N, Schleiger E (2021). A new chapter: Opportunities to seed new industries for Queensland over the coming decade

<sup>79</sup> Deloitte Insights: Distinctive traits of digital frontrunners in manufacturing (2018).

<sup>80</sup> OECD: Regions in Industrial Transition : Policies for People and Places (2019).

## Back Our Regions to Compete Globally: Regions received strong and increasingly more effective support throughout the life of AQ

The aim of this priority is to work with regional communities to grow their unique competitive advantage to build industries and create jobs.

### Immediate actions delivered under the strategic priority

- Improve the quality and speed of internet services in regional Queensland through QCN Fibre
- Deliver a new connection with Townsville's Regional Data Centre through QCN Fibre
- Invest in a Rockhampton Technology and Innovation Centre to provide hands-on training and skills in robotics and automation technology
- Deliver the Regional Entrepreneurship Acceleration Program in Toowoomba, Gladstone and Mackay to encourage localised solutions and job creation
- Develop an SEQ Innovation Precincts Strategy that can be rolled out across regions (*underway*)<sup>81</sup>

### Summary of evaluation findings

The evaluation found that AQ has recognised the growing importance of supporting Queensland's regions, and over the life of AQ mirrored that importance through funding allocation, both within "generic" programs and those specifically targeting regional innovators. This resulted in more than 5-fold increase growth in regional recipients of AQ funding between 2017 and 2021 (Figure 12).

Regional innovation hubs were recognised as critical components of successful growth of the knowledge economy in regions, since when they are done well they provide multi-faceted support that regional business and innovators need to be successful: they promote and help build on region's unique competitive advantage, they provide a physical location to enable connections between likeminded people, foster collaboration and knowledge sharing; and (especially when co-located with regional universities and TAFEs) they provide clear pathways from education into entrepreneurial careers.

Programs that were more effective in regions were those that recognised and adapted for unique differences between city and regional contexts, as well as unique opportunities and challenges in each region where they were implemented. This meant adapting the language to what resonated in regions (for example, replacing references to startups with small business), leveraging local leaders and their networks, and adapting program governance to regional context.

Two main challenges remain:

- 1) **Attraction and retention of talent:** Focus group, workshop participants as well as other evaluations of subsets of AQ programs repeatedly re-iterated ongoing challenges in attraction and retaining people with the right skills and expertise.
- 2) **Digital literacy to enable participation in the knowledge economy regardless of the location:** While QCN Fibre is supporting improvements in quality and speed of internet, it is important to note that physical infrastructure needs to be complemented by digital literacy. Queensland still lags behind other states in this aspect, indicating that hybrid/remote delivery of some of the critical skills and capability building, as well as networking programs might be accessed by all the regional innovators and businesses that could benefit from them.

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<sup>81</sup> This action is being delivered through the development of the *Queensland Innovation Places Strategy* - <https://advance.qld.gov.au/queensland-innovation-places-strategy>

## Scale Up Local Solutions for New Markets: AQ has been successfully facilitating connections and helping businesses to export and scale-up

This priority aims to scale up our entrepreneurs, startups, small-to-medium enterprises (SMEs) and businesses by helping them commercialise ideas, linking them to investors and making global connections.

### Immediate actions delivered under this strategic priority

- Partner with TAFE Queensland to support uptake of new high tech skills training across Queensland.
- Support the growth of social enterprises to deliver economic and social impact for Queensland.
- Champion innovation in government and establish government as a lead customer for innovation.
- Promote investment-ready Queensland startups and SMEs to international investors through Trade and Investment Queensland.
- Provide a pipeline of innovation opportunities for Aboriginal and Torres Strait Islander peoples through the Deadly Innovation Strategy

### Summary of evaluation findings

AQ program designers and administrators have taken great care to design programs that provide appropriate support for businesses and SMEs based on the stage of the innovation pipeline they are currently at, ranging from early proof-of-concept all the way to scale-up. For example, Ignite Ideas provided financial assistance to support innovative ventures with minimum viable product to get them ready for commercialisation and investment required to move into next stage. The Business Development Fund (BDF) complements this, supporting commercialisation through co-investment in high potential products/services through venture capital and/or angel investors. A small number of businesses that progressed along this AQ pipeline and benefitted from both programs. However, while a pipeline approach remains, it is important to note that in later stages the focus has shifted to later stages of that commercialisation pipeline, potentially leaving a gap in support for early-stage innovators and businesses.

One of the key roles under this strategic priority is facilitation of connection-making – businesses with talent, capital, potential business partners (including corporations) and new market opportunities. Businesses often have limited networks and time available beyond day-to-day running of their business to actively seek these out, hence government’s facilitation role becomes critical. Our survey, focus group and workshop data re-iterated this support making connections as one of the key reasons for applying for AQ support; and it has been consistently re-iterated as significant positive outcomes of involvement with AQ, even where key objectives of programs didn’t involve connection-making.

Two key indicators show that AQ has positively contributed to scaling of local solutions to new markets:

- 1) **Growth in knowledge intensive exports:** in a period from the start of AQ until 2020 Queensland’s growth rated outperformed all other Australian states, except New South Wales (see Figure 40).
- 2) **Number of scale-ups:** Queensland has had a strong and sustained growth in scale-ups, with a significant difference between pre-AQ CAGR of 1.53% and post-AQ CAGR of 5.02% (see Figure 37).

While it appears that AQ is on the right track against this strategic priority, two key challenges remain:

- 1) **Availability of venture capital:** Venture capital has been growing in Queensland, but not at the rate that it has in other states, indicating potential challenges in securing capital to scale-up.
- 2) **COVID-19 driven export challenges:** COVID and border closures have introduced disruption in supply chains and exports uncertainty, hindering businesses’ ability to plan and execute their launch or expansion into new global markets. This uncertainty remains, and will likely remain to some degree until the pandemic is finished.

## Invest in Science and Technology to Create Jobs: Opportunity to translate Queensland's high performing research into commercial outcomes and job creation remains

This priority aims to use science and technology to commercialise research and solve the challenges facing Queensland and the world including climate change, protecting the Great Barrier Reef, and energy and water sustainability.

### Immediate actions delivered under this strategic priority

- Leverage Australian Government and industry funding through the \$25 million Research Infrastructure Co-investment Fund.
- Target research funding towards priorities, including water and energy sustainability, healthcare, climate change and the Great Barrier Reef.
- Develop a Queensland Science Strategy to drive the impact and value of Queensland science - *underway*<sup>82</sup>.

### Summary of evaluation findings

Educational institutions are increasingly recognising the importance of innovation and entrepreneurship, including University of Queensland releasing its first Entrepreneurship Strategy in 2018. They are increasingly providing support upskilling of students in innovation and commercialisation, and using various mechanisms (including courses, accelerators etc) to demonstrate entrepreneurial pathways for science and technology students.

Challenges in **translating world-class research into commercial outcomes** remain for Queensland, mirroring the same challenges experienced by Australia in general, which consistently ranks near top of the OECD for research excellence but is less effective at collaboration between industry and researchers to drive the economic benefits of research. Queensland's researchers are highly productive, their work is cited frequently, yet commercialisation rates don't mirror this level of productivity, with one of the root causes being low industry-research collaboration. AQ has made some progress in addressing this, but more work is required to solve this deeply entrenched and widespread issue.

An opportunity to combine Queensland's unique strengths to solve 'wicked' problems remains. There is an opportunity to revisit SBIR program run in early stages of AQ, and understand whether similar model might be effective in engaging Queensland's scientific community in finding solutions.

### Conclusion

Initial analysis indicates that the AQ priorities identified through the AQ Strategy supported focusing of programs, shifting from broad capability building programs to more targeted initiatives to support regions, priority industries and build specific capability.

While progress has been made on each of the priorities in the strategy, key challenges remain, including increasing the uptake of innovation, attracting and retaining talent, improving digital literacy, availability of venture capital, COVID-driven export challenges and translating world-class research into commercial outcomes.

A range of opportunities therefore present themselves to continue to progress these priorities and the future directions outlined in the Strategy. An important caveat is timing, noting that the evaluation analyses AQ's effectiveness from its inception in 2015 until March 2021, and strategic priorities were only introduced in 2019. This means that only two years of data on performance on delivering strategic priorities are available, and outcomes in that time were strongly influenced by the COVID-19 pandemic.

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<sup>82</sup> This action has to date been delivered through the commissioning and publication of a new report to help inform strategic decisions around science-driven industry development opportunities in Queensland – "A New Chapter – Opportunities to seed new industries for Queensland over the coming decade", released in June 2021. This report strongly aligns to the core business of supporting the development of Queensland's science sector.

### 4.3.2 Performance of AQ in supporting development of priority industries

AQ supported the growth and development of these industries in two ways:

1. The development of 10-year industry roadmaps: through collaboration between government, industry and research organisations.
2. Funding to support implementation of the roadmaps and actions plans.

#### **Industry roadmaps were supported by AQ, but not all identified priority industries have been branded and funded by AQ**

In 2016, \$1 million was allocated to the development of the following AQ priority roadmaps:

- Advanced manufacturing – released 2016
- Biofutures – released 2016
- Biomedical and Life Sciences – released 2017
- Defence and Aerospace – released 2017
- Mining equipment, technology and services – released 2018

Roadmaps were a result of extensive industry stakeholder engagement and developed using a ‘bottom-up’ approach in which industry stakeholders were asked to identify the top priorities for their industry. This was then considered alongside other information to develop government priorities, plans and support for the industry in the long term.

Approximately \$38 million of AQ funding has subsequently been allocated to the implementation of these Roadmaps, as well as substantial amounts of non-AQ funding. An additional \$28 million provided for the development and implementation of the Queensland Hydrogen Industry Development Strategy.

While eleven industries were defined as priorities in the AQ Strategy, this does not provide a complete list, nor does it mean that all of those industries are supported through AQ for their roadmap development and implementation. For example, additional priority industries/sectors were identified 2018/2019 which were not incorporated into AQ funding, nor branded AQ, including Beef Processing and Superyachts. Further, some industry roadmaps and action plans, including Screen Industry, Agriculture and Food, Resource Recovery and Tourism while identified in the AQ Strategy are not funded through the \$755 million AQ investment.

#### **Reach to priority industries remains unclear because of the lack of standardised and consistently used definition of priority industries and limited data collected to identify recipients in those industries**

The majority of AQ programs did not target priority industries in their funding guidelines, nor was there a requirement for applicants or recipients to indicate which priority industries, if any, their project contributed towards.

Some effort has been expended to retrospectively map funded projects to ANZSIC Sectors and AQ Priority Industries, with an aim to map the projects against the industry sector which will principally benefit from the project. The analysis of mapped program data shows that 7% of AQ funded projects contributed to the development of priority industries. However, this number is likely much smaller than actual representation of priority industries, mainly due to the fact that a large majority of projects (73%) had to be mapped against Professional, Scientific and Technical Services as per ANZSIC coding. However, detailed analysis of project titles reveals that those recipients often contribute their services and, as a result, participate in development of priority sectors, including for example tourism, hydrogen and biofutures, and/or spanned multiple industries and specialisations. This is not visible from the program data.

Further, AQ recipients that responded to evaluation survey were asked to declare which sector their enterprise/institution or organisation primarily operates in. Similar to analysis conducted by DTIS, most AQ participants did not come from organisations that primarily operate in a priority sector. Manufacturing fifth among participants who responded to the survey, biomedical eighth, and others were far lower. However, this again is likely not an accurate representation of program participants, grant recipients or procurements and partnerships, and resulting impact of that funding on innovation industries. This is especially true of sizeable investments in specialist infrastructure and pieces of equipment, which appear to have been critical in reaching the researchers, engineers and other highly skilled roles in high-tech and advanced industries, without which, they would have gone elsewhere (refer infrastructure case study for further information on the roles it played supporting culture and other AQ strategies).

### **Effectiveness of AQ in supporting development of priority industries is inconclusive due to data limitations and the long-term nature of industry development**

This complexity of ownership and roles across government departments (specifically shared responsibility for industry development) leads to distributed and inconsistent reporting. AQ only had responsibility of funding development and implementation of a portion of roadmaps, hence the data the program was able to collect to inform progress on broader industry development progress was limited. This meant that evaluation could not get a complete picture of total funding (through AQ and other programs) that was invested into development and implementation of roadmaps.

The 10-year roadmaps have only been in place around three years, which makes assessment of their impact inappropriate, not only because implementation has not been completed but also because of lag indicators – the nature of industry growth, particularly emerging industries, means that it takes a longer time before outcomes are realised. However, the amount of funding allocated to development of those industries can be treated as a leading indicator. Program data shows funding is flowing as planned to these identified industries, and other priority industries, as evidence not only through major procurements and investments, but also in the fact that up to 10% of recipients of grants are working in the identified priority industries (and anecdotally even higher percentage of total funding, but exact data point is not available due to data limitations).

### **Stakeholders highlighted important role that Government plays in developing priority industries, critical role of innovation in that process and need for alignment**

Stakeholder interviews highlighted several important roles that the state government could play the continued development of priority industries. These included: promotion of importance of innovation with industry (particularly SMEs and established companies); taking the lead on stakeholder engagement to understand industry challenges; and identifying and connecting businesses with funding opportunities across all levels of Government.

Stakeholders pointed to an opportunity to sharpen the alignment between various departmental and AQ roadmaps to fill gaps in industry development. Focus groups with funding recipients, and research and industry partners reinforced this finding; and it is further reinforced by data limitations due to distributed ownership of priority sector development between AQ and other Government departments and programs.

Additionally, there is an opportunity to review the approach to industry development (and role of innovation within it), and the relevancy of current roadmaps, in light of COVID-19 recovery and the six economic recovery areas as identified by Queensland Government (Safeguarding our health, Backing small business, Making it for Queensland, Building Queensland, Growing our regions, Investing in skills).

Finally, there is an opportunity to review list of priority industries in light of new research and reports – considering for example eight emerging ‘knowledge intensive industries’ identified in 2019 in the “New Smarts Report” (Sustainable energy, Cyber-physical security, Smart mining, exploration and extraction, Personalised and preventative healthcare, Advance material and precision engineering,

Next generation aerospace and space technologies, Advanced agriculture, Circular commodities) and further nine emerging, knowledge-driven seed industries were identified in 2021 in the New Smarts A New Chapter report (Additive biomanufacturing, AI-enabled healthcare, Green metal manufacturing, Resource recovery technologies, Microalgal and macroalgal resources, Agricultural sensors and automation, Supply chain provenance technologies, Disaster resilience and response technologies, Construction technologies).

## Conclusion

Importance of a multifaceted role of Government, and innovation within it, is clear and strongly recognised by stakeholders. However, there is limited clarity in distribution of roles and responsibilities between Government Departments; and opportunity for better alignment between them in achieving a shared objective of industry development.

AQ supported development of priority industries through funding for development and implementation of a portion of roadmaps. Initial data is showing that funding is flowing to those industries as intended. However, fully quantifying and understanding reach and effectiveness of AQ's investment is difficult due to data limitations, in particular inconsistent definition of priority industries, incomplete reporting due to distributed ownership and funding and long lead times in seeing impact due to ten-year industry development horizon.

## 4.4 Unintended outcomes

AQ had a number of objectives and outcomes, as detailed in Figure 6 – AQ Framework and the Program Logic (Appendix C). Participants of the innovation ecosystem were asked to detail any unintended outcomes that they observed, acknowledging that each of them will likely use program they were involved in as a frame of reference for what is intended and unintended. Very few participants had visibility of the entirety of AQ and its intended outcomes.

### There were no major unintended negative consequences

Given that AQ comprises approximately 140 programs and more than 7,5000 recipients, there were no major issues identified in terms of some programs or individual grants causing any disasters. While a few programs could have been better targeted or better designed, overall, the AQ funds were invested in areas that resulted in positive outcomes.

There were three main themes of minor unintended negative outcomes: crowding out, administrative burden and dependency on government funding.

1. **Crowding out:** While no major crowding out was found (indeed private investment increased), some anecdotal or minor examples were noted:
  - a. Participants reported instances where AQ funding leading to some short-lived startups in regional areas competing with, or pushing out, established local companies and services.
  - b. Participants reported instances when government held networking events displacing those that are privately run, creating a gap when government funding was channelled elsewhere.
  - c. Slower growth in venture capital funding than other comparator states might have been due to strong Government funding growth crowding out private investment, but no strong proof exists.
2. **Administrative burden:** Some participants reported significant and disproportional administrative burden involved in drafting their application and providing reporting. This was most often reported by researchers, and in particular recipients of Industry Research Fellowships and stakeholders in the ARIP.
3. **Dependency on government funding:** Some programs became reliant on government funding, expecting it to be renewed at contract/grant expiry, and putting limited effort into creating sustainable business models.

### Certain positive outcomes were unexpected to participants, but majority of them were planned and anticipated by AQ program designers and administrators

Most of the reported positive unintended outcomes aligned with AQ's broader objectives even though they didn't align with specific programs or events that individuals had participated in. The following were frequent responses to the survey question on "unexpected outcomes" observed by participants, but were actually part of the plan all along. These observations also provide qualitative indicators of innovation diffusion and adoption:

1. **New connections** with other innovators, entrepreneurs and researchers, leading to a "vibrant ecosystem" with fruitful information exchanges, informal support, and formal partnerships. This ranged from gaining a supportive network to connection with other providers offering complementary technologies in the same sector leading to partnerships.
2. **A "halo" effect** that brought greater attention and legitimacy to their work, as well as leading to improved staff morale. This opened up further funding or expansion opportunities, such as federal grants. Ignite Ideas appears to be a program whose participants often emphasised this "unintended" consequence.
3. **New knowledge or ways of working** (including for businesses and government). This often led to further career opportunities (for individuals) or improved productivity (for organisations).



4. **Scaling of a small business** into different sectors or products, including completely unexpected markets.
5. **Changed mindsets around innovation** - which is now better understood and valued "as Queensland ingenuity" which can happen in any field, business or part of the state.


These positive outcomes indicate that AQ programs positively reinforced each other, amplifying the reach, effectiveness and efficiency of AQ.

### COVID-19 was unexpected, but it accelerated achievement of some of AQ's objectives

Additionally, COVID-19 aided accelerated achievement of AQ objectives, especially as they relate to uptake of digital tools and innovative processes. A lot of organisations were "forced" to rapidly upskill in digital space and increase their digital readiness, making hybrid delivery of networking events and capability building more viable. This led to increased reach in regions, and has laid groundwork for increased adoption and diffusion of innovation.

Further, stakeholders reported that many organisations had to adapt their processes and become more innovative in the way that they do business in light of COVID-19 challenges and disruptions. This included, for example, re-thinking their supply chains and customer communication channels.

Finally, some participants reported that AQ support allowed them to setup improved processed pre-COVID-19, which then helped their organisation "survive" COVID-19.



"AQ put Queensland on the map! There is now international recognition across APAC and SE Asia for Queensland and its outreach initiatives as a forward-thinking state supporting innovation and startups" – *Survey respondent, investor*

"Greater exposure of STEM to the general public and a self-belief that STEM advancement can even happen in the most rural and remote of settings. Inspired the community to dream big with students who were very capable innovators in STEM." – *Survey respondent, teacher*

"Staff became more innovative and were more comfortable using the technology which created more business"

– *Survey respondent / startup*

### Conclusion:

AQ is a large and complex initiative. The evaluation didn't find any major negative outcomes, indicating that the program was designed and run well, despite the complexity, its aim and delivery environment. There were only isolated and often anecdotal instances of crowding out, excessive administrative burden and created dependency on government funding.

Participants did report a wide range of positive unexpected outcomes, but in most cases those were absolutely intended by program designers and administrators. Additionally, COVID-19 has unexpectedly led to accelerated achievement of some of AQ's outcomes, particularly as they relate to adoption of digital tools and innovative processes.

## 4.5 Efficiency: To what extent has the AQ initiative provided value for money?

### 4.5.1 Overall value for money

#### Introduction/context

There are inherent challenges with doing a precise cost benefit analysis (CBA) for AQ. Firstly, the outcome areas of AQ are large and influenced by many factors. There is no perfect 'control group' to compare to. Nous' approach has been to compare Queensland's performance against three comparator groups.

- growth in Queensland Knowledge Economy since AQ to that of before AQ
- growth in Queensland since AQ compared to other states
- survey of performance of AQ participants and recipients compared with firms that did not engage with AQ.

While these options help to isolate AQ's performance they have limitations. Performance before AQ in Queensland is influenced by the various investments in innovation that resulted from previous initiatives, and thus is not a perfect baseline. Other states also have their own investments in innovation, and some of these are greater than AQ, in addition there are Commonwealth programs. They also have inherently different economic and market structures.

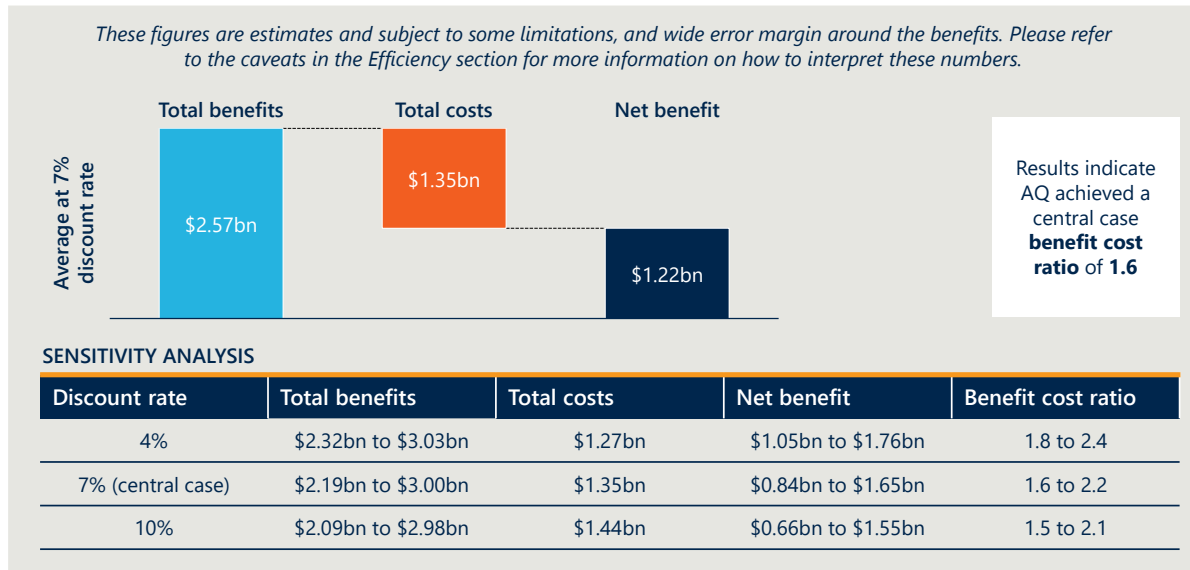
Nous have compared intra-Queensland by comparing the results of AQ participants and recipients against SMEs who did not engage with AQ. This analysis relies on the results of the survey Nous ran for this evaluation and while thorough statistical analysis has been conducted to ensure the results are accurate, there is an inherently large confidence interval around the estimates. There are also only three years of data in which AQ spend has happened (apart from GSP data which has four due to a recent release of 2020-21 data). There is also over \$100 million worth of AQ investment in the pipeline. This means AQ is still relatively young in terms of the innovation life cycle. It is impossible at this stage to anticipate all the outcomes of AQ. For example, improving capability of the current workforce might result in an increase in the capacity to develop vaccines in Queensland which might not reveal itself until a future crisis. These benefits also include those of non-monetary nature. Metrics like better health outcomes are difficult to measure at this stage. The approach to benefits calculation used should capture the impact of these outcomes at a macro-level (given the use of GSP as a benefit, which captures increased value added in the economy). Some of these non-monetary, qualitative or equity outcomes also do not have a direct conversion into monetary measures, but are discussed elsewhere in the report. All together, these factors mean that it is hard to fully calculate the likely future benefits of AQ with a high degree of precision. Thus, the figures presented in this section should be taken as illustrative estimates based on the information available at this time.

These empirical realities mean that the results of the CBA have a wide margin of error. Beyond the measured benefits, there are also equity outcomes and other important qualitative outcomes which were not included in the benefits, however these are reported elsewhere, so the CBA can be viewed in combination with other qualitative and quantitative insights presented in the other sections of this report to understand the full AQ impact.

### KEY FINDINGS:

CBA measures the benefits to all Queensland residents, not just to the government’s bottom line, and this could be in the form of higher wages for Queenslanders, or higher profits for Queensland-based business owners. The Net Present Value (NPV) of benefits minus costs from this analysis is a range of \$0.84 billion to \$1.65 billion, with a benefit to cost ratio (BCR) range of 1.6 to 2.2. This means AQ likely delivered more benefits to Queenslanders than it cost by a ratio of at least 1.6 to 1. There is complexity in quantifying benefits. As such, it is prudent to focus on the lower end of the BCR and NPV as a central case (i.e. 1.6 and \$0.84 billion, respectively).

Figure 49 | Summary of CBA results



### Costs

The total cost of AQ is made up of two main categories: real government expenditure and leveraged private investments by Queensland residents:

- **Real government expenditure** includes investments in AQ programs that directly results in the use of real economic resources (such as administration staff, labour, construction or the purchase of equipment). Whereas payments from AQ that are income transfers to other Queenslanders (such as scholarships, untied grants or fellowships) were excluded as they do not incur a real resource cost to the economy. There are also additional administrative costs that have not been included in the \$755 million governmental spend figure. DTIS’s analysis of grant administration costs on a small sample of AQ programs found that for every \$1,000 dollars of grant funding, administration costs range from \$60 to \$107. This implies administration costs are expected to be in six to 11 per cent range of total funding distributed.<sup>83</sup>
- **Leveraged private expenditure** includes ‘leveraged’ investments by Queensland-resident businesses or organisations (e.g. a business committing \$1 to match each \$1 of government funding). This was estimated based on the amount at the time of contract signing, which may differ from the final result.

<sup>83</sup> This analysis includes development of grant program material, delivery of funding rounds, assessment of submissions, agreement negotiation, contract management, promotion and reporting, but excludes program design and evaluation functions. While the analysis provides insight into efficiency of grant administration, it is important to note that there are many factors that drive administration costs of grant programs, including grant types, size, outcomes and risk profile. Therefore, detailed analysis of all those factors would need to be conducted to provide an assessment on relative performance of AQ’s administrative efficiency compared to other grant programs. The Macro-1 Evaluation of Advance Queensland included qualitative analysis of administration costs of AQ and concluded that, according to stakeholder consultation outcomes, AQ’s administration costs are low.

These are included in costs for the CBA as any funds coaxed from Queensland businesses due to AQ reduces the amount of investment elsewhere in the economy. AQ programs that result in 'leveraged' investments from non-Queensland residents such as the Commonwealth or non-Queensland companies do not incur a cost for Queensland – it increases the level of investment in the state, and therefore are not included as a cost of AQ.

Information on costs for the approximate 140 AQ programs was categorised based on the concepts above. The costs are allocated to the year the funds were spent on a cash basis. Note that some funds (approximately one-third) are not yet spent but have been contractually committed to recipients. These funds are expected to be spent over the coming years until 2024, and thus have been included in calculations.

Then all costs are converted into 2021-22 present values at a seven per cent discount rate, with sensitivities of four per cent and ten per cent. A marginal cost of public funds of 30 per cent is used, so an income transfer of \$1.00 has a real cost of \$0.30, while a real expenditure of \$1.00 has a cost of \$1.30.

This results in a net present value (NPV) cost of AQ between \$1.27 billion and \$1.44 billion.<sup>84</sup> This includes all funds committed but not yet spent. This is higher than the 'headline' budget of AQ because:

- funds spent prior to 2021-22 have been brought up to 2021-22 values at a real discount rate of seven per cent
- some additional costs were incurred by other Queensland residents (companies, NFPs etc) to match funds from AQ
- the administrative cost associated with administering grants that is not included in the headline AQ figure, which is an upper bound based on known costs for a small number of programs.
- the additional marginal cost of public funds, noting AQ was funded from general government revenues rather than specific 'hypothecated' sources such as mining royalties.
- This works out at a (central case) cost per Queenslander of \$259 for the whole AQ initiative (*not per annum*).<sup>85</sup>

## Benefits

Nous has adopted three approaches to estimate benefits. The average of these three metrics results in the summative NPV benefit for AQ. This helps reduce the sensitivity attributable to various assumptions made.

### Approach 1: Productivity increase

The main macro-level benefit of AQ for Queenslanders is productivity, which contributes to lifting our living standards. This is because innovation, through initiatives such as AQ enables Queensland to have higher living standards for a given amount of inputs of labour and capital.

As noted earlier in this report, AQ has coincided with growth in the knowledge economy, jobs and productivity.<sup>86</sup> Note that changes in productivity often take time after investments in innovation initiatives, reflecting the 'lags between investment and output'<sup>87</sup>. Productivity is also influenced by many things outside of the control of AQ. These factors, in combination with only having a few years of data to analyse, means that it's important to use other indicators to investigate the impact of AQ. To accommodate for this uncertainty, a sensitivity analysis and confidence interval has been provided for productivity.

We can observe that Queensland has generated a solid productivity and economic growth performance over recent years. Based on the analysis, literature and research to date, we have modelled an increase in the productivity of the knowledge economy of 0.03 per cent per annum from 2016-17 to 2020-21. This is

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<sup>84</sup> Data for all costs was sourced from internal DTIS documents and whole-of-initiative program data.

<sup>85</sup> Based on a population of 5.22 million, <https://www.qgso.qld.gov.au/statistics/theme/population/population-estimates/state-territories/qld-population-counter>

<sup>86</sup> Some intangible outcomes (like improved health from a clinical trial or innovation caused by an AQ program) cannot be easily quantified at a macro-level, so the true monetary benefit is likely to be higher than the one reported here.

<sup>87</sup> Queensland Productivity Update 2018-19, QPC

applied to real GSP of the knowledge economy. Note that GSP is made up (essentially) of wages plus profits, so GSP captures both the increased profits to small business owners and entrepreneurs, and also the increased earnings paid to more skilled workers, due to AQ.

This approach results in a NPV benefit for AQ between \$2.09 billion and \$2.32 billion. This is the additional living standard Queenslanders receive due to AQ, which works out at a central case estimate of \$420 per person in Queensland (across the life of AQ, *not* per annum).

### **Approach 2: Knowledge economy outperformance**

Another approach to quantify the macro-level benefit of AQ for Queenslanders is the increase in gross state product of the knowledge economy relative to other States.

This theoretically captures all outcomes of AQ. However, it is so broad that it also captures the impact of other government investments and underlying trends. To determine an appropriate amount of this change that can be attributed to AQ, the knowledge economy was examined (see Appendix D for how this was defined). This excluded mining and focused on knowledge sectors of the economy (note no formal definition of the knowledge economy has existed since establishment of AQ). The growth of the knowledge economy GSP in Queensland was then compared to underlying real growth of two per cent per annum. This figure was determined based on the previous trajectory of the knowledge economy in Queensland, and other jurisdictions, prior to AQ. While no formal growth KPI was set for AQ, two per cent represents a more realistic target than just growing the knowledge economy by more than zero per cent per annum.

The amount of change in GSP attributable to AQ is a difficult assessment to make. Nous' approach has been to investigate the amount of other Queensland Government investment that has been made alongside AQ. There have been large increases in the funding of higher education, health, and other industry support during the period of AQ. The investments included in this analysis do not include those which are considered routine (e.g. ongoing funding of schools and hospitals).<sup>88</sup> Once these other changes in government spending are accounted for, total AQ funding makes up only 22.5 per cent of total additional government expenditure (see Appendix D for details). This figure was then used to apportion the amount of change in the GSP of the knowledge economy attributable to AQ.

This approach results in a NPV benefit of AQ between \$2.46 billion and \$2.59 billion. This is the additional living standards Queenslanders receive due to AQ, using the second method, which works out at a central case of \$481 per person in Queensland. This is not additional to the amount above, it is an estimate of the same benefit using a different method.

### **Approach 3: Business revenue outperformance**

The third approach made use of the survey data collected by Nous to calculate the business revenue outperformance of AQ recipients and participants, compared with those SMEs that did not engage in AQ.

The median growth in revenue for those businesses who participated in AQ was calculated to be 2.05 times higher than those who did not participate. This was used in combination with a benchmark five per cent annual nominal growth figure expected by SMEs.<sup>89</sup> Together these figures were used to calculate the outperformance of revenue attributable to businesses who participated in AQ. Revenue was then converted into value added using ABS data for the professional and technical services sector.<sup>90</sup>

It was assumed that the increase in value added would start to reduce several years after the initial grant.

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<sup>88</sup> Over this period there have likely been increases in Commonwealth funding that may have influenced the performance of the knowledge economy in Queensland, however those investments are out of scope for this evaluation.

<sup>89</sup> This benchmark market growth figure was calculated on the basis of ANZSIC division using ABS data. A continuous distribution is estimated from binned (histogram) data by fitting a log normal distribution to the ABS data series 8165.0 'Count of Australian Businesses, including Entries and Exits'. This approximated distribution is then used to estimate the average revenue in a given financial year for each ANZSIC division. That is, in the absence of AQ, SMEs in Queensland are estimated to grow at 5% per annum nominal.

<sup>90</sup> ABS publication 5209.0

This approach results in a NPV benefit of AQ between \$2.98 billion and \$3.03 billion, or a central case estimate of \$575 per Queenslander (in total over the life of AQ, *not* per annum). Again, this is not additive to the benefits above, but a different method for calculating the same benefit.

### Benefits minus costs

The NPV of benefits minus costs from this analysis is a range of \$0.84 billion to \$1.65 billion, with a BCR range of 1.6 to 2.2. This means AQ likely delivered more benefits to Queenslanders than it cost by a ratio of at least 1.6 to 1. There is complexity in quantifying benefits. As such, it is prudent to focus on the lower end of the BCR and NPV as a central case (i.e., 1.6 and \$0.84 billion, respectively).

### Small level of duplication within and outside of AQ initiative exists

AQ programs, by definition, include some level of overlap as they contribute to achieving shared objectives. Further, because programs were often rolled out relatively quickly to respond to immediate market needs, a thorough scan of existing programs (both within and outside AQ) wasn't always conducted.

Despite this, the evaluation team has not identified any areas of significant duplication. We have heard that some organisations participated and benefitted from multiple programs, but this was often by design, as those programs contributed to distinct outcomes for participants. For example, AQ has had two significant programs supporting organisations along the commercialisation pipeline:

- Ignite Ideas: financial assistance to support innovative venture with minimum viable product and get it ready for commercialisation and investment required to move into next stage
- Business Development Fund (BDF): supporting commercialisation through co-investment in high potential products/services through venture capital and/or angel investors

The importance of the pipeline is noted through 32 per cent of BDF recipients having previously received Ignite funding. The impact of AQ support for commercialisation activities is further evidenced by the number of Ignite Ideas and BDF recipients who, because of their participation on those programs, have then been competitive for the Australian Federal Government program *Accelerating Commercialisation* (AC) which provides guidance and financial assistance to help commercialise novel products, processes and services. Notably, 11 per cent of Ignite recipients and ten per cent of BDF recipients received federal AC funding<sup>91</sup>.

This duplication only becomes an issue if we see businesses being repeatedly supported that don't have a sustainable business model and cannot be viable once when government support ceases. This then leads to no return on a large government investment, as well as large opportunity cost. A rapid review of Innovation Partnerships<sup>92</sup> highlighted examples of some recipients not creating sustainable business models, and, as a result, their activity and contribution to the economy no longer continuing after AQ funding stopped.

In addition to the analysis of duplication within the suite of AQ programs, it is important to also note additional important areas where duplication arise:

- **Duplication with other government initiatives across levels of government (federal, state – other portfolio programs and initiatives, local):** Similarly to the arguments outlined above, because of its size and complexity, AQ overlaps with a number of other government initiatives. However, there is evidence of coordination and collaboration between levels of government to avoid duplication, for example state funding for some programs contingent on federal funding. On the other hand, anecdotal evidence suggests that lack of coordination between levels of government resulted in

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<sup>91</sup> DTIS, AQ program data

<sup>92</sup> Nous conducted a rapid review from July to October 2021 of Innovation Partnerships – a portfolio of seven one-off investments within the AQ initiative

'scattered' and underutilised infrastructure, and that coordinated approach would be better thriving innovation hubs.

- **Duplication with private offering and funding:** Analysis showed that AQ funding didn't displace private investment, with private investment in R&D growing strongly alongside AQ. However, qualitative evidence suggests that, in some isolated cases, government funding of programs resulted in private providers pulling out of supporting programs with similar objectives. An example of these are networking events, with anecdotal evidence suggesting that private providers are no longer hosting some events after the OQCE initiated similar events, supported by Queensland Government. Even when those events are no longer supported by the government, private providers might be slow or reluctant to get back into this market. However, that issue was not widespread.

## Conclusion

CBA measures the benefits to all Queensland residents, not just to the government's bottom line, and this could be in the form of higher wages for Queenslanders, or higher profits for Queensland-based business owners. The NPV of benefits minus costs from this analysis is between \$0.84 billion to \$1.65 billion, with a benefit to cost ratio range of 1.6 to 2.2. This means AQ likely delivered more benefits to Queenslanders than it cost by a ratio of at least 1.6 to 1, suggesting AQ was cost-effective. There is complexity in quantifying benefits. As such, it is prudent to focus on the lower end of BCR and NPV from the central case results reported above.

The evaluation didn't identify any areas of significant duplication. The evaluation team heard that some organisations participated and benefitted from multiple programs, but this was often by design, as those programs contributed to distinct outcomes for participants. Additionally, in some isolated cases repeated government support led to unsustainable business models. Some stakeholders provided anecdotal evidence of non-constructive duplication with federal and local government funding, as well as private funding.

Table 5 | Opportunities to maximise efficiency

Opportunity	Supporting findings and details
<p><b>10. Broaden options for 'leveraging' public funds beyond the state</b></p>	<p>AQ has been successful at 'leveraging' public funds with investment from the private sector or NFPs. However, this could be more nuanced: for example, attracting a greater share of Commonwealth R&amp;D funds, or additional investment from non-Queensland-resident investors is more important at growing the size of the Queensland pie than distorting the investment decisions of Queensland-resident firms. There are also cases where pure public funding is optimal.</p> <p>Become more targeted when 'leveraging' public funds – while certainly good in some cases it is not always beneficial or necessary and should not be a blanket policy that funds should always be 'leveraged'.</p>
<p><b>11. Build in sustainability considerations when awarding funding to avoid creating dependency</b></p>	<p>Government funding can result in businesses that are not commercially viable being supported over a prolonged period of time, and no longer continuing when that funding is no longer available. Government should continue and expand good practices in ensuring sustainability of businesses beyond funding end date, including sustainability assessment when funding is awarded, embedding sustainability considerations into contract KPIs and gradual funding withdrawal.</p>

## Opportunity

## Supporting findings and details

Innovation/STEM areas in particular have been recently well funded, such that many businesses are readily provided access to grants. This creates a risk of financial dependency and entitlement, and possibly duplication. The government should balance the need to support in-vogue fields with not being too eager, and to avoid innovation bidding wars with other States and to prevent paying over the mark (like Vic/SA bidding for the "Formula 1 Grand Prix" in times past) to attract marquee innovators to Queensland.



## 5 Lessons Learnt

This section provides lessons learnt to inform future Queensland Government decision-making and priorities, including:

- Role of Queensland Government in supporting innovation driven growth
- Continuous improvement in program design and reporting

### 5.1 Role of Queensland Government in supporting innovation driven growth

Queensland's innovation stakeholders identified multiple value roles for the state government. In focus groups, the most common and well-articulated responses focussed on enabling and connecting local leaders, growing these leaders' capacity through sustainable funding targeted as the most high-impact activities (described as mentoring and networking, investing in important research or technology projects), and helping makes these connections between local leaders across the state. This was described as involving facilitation, leadership, policy settings which supported (or didn't actively hinder) business growth, research, businesses access to capital, and which encouraged investment, such as a clear plan or roadmap.



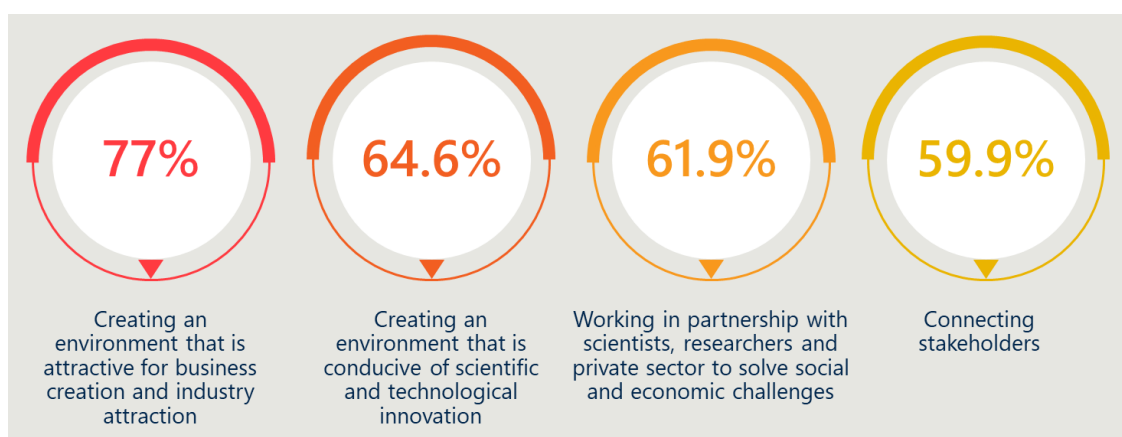
"Government needs to support the local landscapes while doing deep community change and building up the gaps. [To do this well] they need to know the local landscapes, the different skills and industries in each region, and building up what is unique to them." – *Regional innovator*

"Government needs to stop changing and reinvesting strategies and programs. The big challenges... take decades. We need to build the capabilities, the pipeline, by increasing enrolments in STEM in school, TAFE and uni." – *Chief Scientist*

"We need visionary leadership, clear communication on the existence and value of the different programs available, and to make it easier or possible for schools to do them, including greater investment in education overall." – *Teacher*

The answers selected by questionnaire respondents align with those given in focus groups. When asked what they see as role of government in supporting the market in its progression of new ideas, research, technology or innovations, the most commonly selected response by the survey respondents were:

Figure 50 | Survey response on the role of government in innovation



Queensland Government exists within the broader Australian three-tiered government hierarchy, with different levels of government playing different roles and using a set of levers and tools available to them. Queensland Government has been supporting the development of the innovation ecosystem through a variety of levers, for example:

- **Capacity-building infrastructure:** Investing in infrastructure to drive collaboration and provide pathways to commercialisation, scaling for growth and creating jobs.
- **Capacity building:** Supporting the broader innovation ecosystem by connecting ecosystem leaders, leveraging regional strengths and sector expertise.
- **Outcome-setting:** Building and sustaining momentum through innovation agenda setting to promote a culture of innovation, entrepreneurship and science with a longer-term focus, over multiple governments and changes of government.
- **Incentives:** Incentives to invest in strategic industries (i.e. advanced manufacturing) to maximise impact across the ecosystem and drive innovation within existing businesses.
- **Rule-setting:** Creating environment that attracts talent and capital to grow and maintaining a successful innovation ecosystem and sustainable enterprise.

Lessons learnt for Queensland Government to consider and extend its role going forward to support innovation driven growth are outlined below.

**Table 6 | Lessons learnt for Queensland Government in supporting innovation driven growth**

Lessons	Supporting findings and details
<p><b>A. The Queensland Government can continue to use a portfolio approach to grow the knowledge economy.</b></p>	<p>A portfolio approach allows for investments of mixed risk profiles based on an acknowledgement that innovation is inherently risky and not everything is going to succeed, and thus necessary to take a few chances. Although the idea of the innovation ecosystem is still being developed in literature, developing thinking suggest it's an appropriate approach for government policy.<sup>93</sup> The benefit of a portfolio approach and taking some risks was also reinforced in consultations with investors, key officials and AQ recipients.</p> <p>It also allows government to change the structure of the portfolio based on emerging ecosystem needs and current risk appetite.</p>
<p><b>B. The Queensland Government can continue to identify market failures and use targeted investments to 'fix' them and assist the economy to grow by opening new areas.</b></p>	<p>Typically, the role of government is to ensure the legislative, regulatory and policy settings enable and do not hinder innovation. The Queensland Government through AQ has a track record of going beyond policy settings and taking an active role in identifying and fixing market failures. Office of the Chief Queensland Entrepreneur (OCQE), for example, was established to respond to a lack of supporting facilities such as accelerator and mentors, as well as limited connection with entrepreneurs to grow capability and capacity across industries.</p> <p>Future government investments in innovation could target weak points along the innovation value chain (for example, known 'valley of death' in biomedical research translation to human trials), where there is a clear role for government intervention to assist the economy to grow by opening new areas, maximise the return on investment and potentially de-risking private investment.</p>

<sup>93</sup> Brown, R., Mason, C. Looking inside the spiky bits: a critical review and conceptualisation of entrepreneurial ecosystems. *Small Bus Econ* 49, 11–30 (2017).

Lessons	Supporting findings and details
<p><b>C. The Queensland Government should review its procurement strategy to better support Queensland's innovation ecosystem.</b></p>	<p>Queensland Government spends billions of dollars procuring a significant amount of goods and services (specifically \$17 billion in 2020). However, Government procurement policies are typically characterised by risk aversion and immediate costs rather than long-term value for money. This means that newer and smaller enterprises – including innovative businesses that have benefited from AQ – can experience challenges with securing procurement contracts to supply goods and services.</p> <p>Reconsidering these, where possible, is a logical step to help small and innovative businesses in Queensland to commercialise their products and ideas developed with the help of AQ, while also amplify the government's return on investment, in turn enabling these businesses to scale and offer more local jobs.</p> <p>Firstly, Government should re-consider risk profile and amending procurement policies to better support purchasing from early stage/innovative businesses.</p> <p>Secondly, large established companies benefit from economies of scale that allow them to offer established solutions at prices that undercut SMEs or new innovative solutions. Government should review focus on long-term value and emphasis on short-term savings, for SMEs or new enterprises.</p>
<p><b>D. Define clear ownership for priority industry development, role of innovation within in and reporting requirements.</b></p>	<p>Evaluation found that assessing reach and effectiveness of priority industry development has been limited due to incomplete data, inconsistent reporting requirements and insufficient granularity.</p> <p>Government should review its approach to priority industries, defining clear roles and responsibilities of Government departments (including DTIS and DSDILGP) within the broader priority industries development agenda. Further, given the importance and emphasis on priority industries, they should be included in reporting requirements so that accurate, complete and sufficiently granular data is available to understand reach of initiatives into priority industries, funding awarded and impact of the funding.</p>

## 5.2 Continuous improvement in program design and reporting

AQ is a large-scale, complex initiative delivered by a number of government agencies. While it has a specific innovation focus, lessons learnt from its implementation and evaluation, are applicable across similar initiatives, especially those aimed at capacity building.

Table 7 | Lessons learnt on cross-agency program design and evaluations

Lessons	Supporting findings and details
<p><b>E. Program design should balance the need for fast-paced decision making often necessary in the 'innovation industry' with the need to provide sufficient certainty</b></p>	<p>Government should take into account the differences between government, industry and innovation lifecycles and operating constraints and align its processes to this:</p> <ul style="list-style-type: none"> <li>Consider allocating a proportion of funds to support immediate opportunities that might otherwise be missed. This would enable fast-tracked decision-making processes</li> </ul>

Lessons	Supporting findings and details
<p>through advance notice and longer-term programs.</p>	<p>for spending government funds by authorised officials where certain accountability pre-conditions have been met.</p> <ul style="list-style-type: none"> <li>• Take a longer-term approach (beyond five years) to program design, with built-in ability to adapt to changing priorities and capacity, and emerging opportunities. The approach used by Deadly Deals could be replicated and scaled.</li> <li>• Provide advance notice – ideally four to 12 months – of major investment opportunities requiring institutional collaboration or co-investment. This is because it takes months or longer to set up or adapt an effective collaboration, and because cash-flow and human resourcing availability can be severely restricted at different points in a given year. Forewarning allows for advance planning to enable more applicants/proposals and higher-quality applications/proposals.</li> </ul>
<p><b>F. It is imperative to embed outcomes measurement and reporting to demonstrate value of each program, especially those attracting greater public or political scrutiny.</b></p>	<p>Australia has a number of best-practice examples of carefully accounting for taxpayer funds invested in innovative programs and initiatives. Future programs could draw on these areas for good practice when designing and implementing any programs, and justifying the use of taxpayer funds, on valid programs that could have the appearance of a 'junket' by demonstrating the tangible and quantifiable benefits these bring to the state.</p>
<p><b>G. Grant recipients need to be accountable and demonstrate outcomes for government money received.</b></p>	<p>A common refrain is that people are happy to receive money from government, but then want government to 'get out of the way' or want government to wait for seven to ten years to see results which 'takes time'.</p> <p>All recipients of public money – including for extended scientific research projects – should clearly track and report how they use these funds to progress towards their innovation objectives, including reporting on short- and medium-term outcomes (beyond the funding term) that serve as leading indicators to achieving long-term objectives. Long term funding grants could include periodic reporting on factors that may serve as leading indicators to the early benefit of the industry sector.</p>
<p><b>H. Government could recruit and/or engage more with experts who understand market realities and specific subject matter (where investment is targeted) to add input for sound program design and decision-making.</b></p>	<p>Government could recruit more widely from industry, in particular people with experience in business, industry and commercialisation and technical expertise so that programs are designed by people that understand the current gaps in the market, the commercial aspects of scaling innovation to create jobs and growth with a stronger connection to current best practice and industry trends.</p> <p>Where this expertise is not available in-house, government should include experts in program design, assessment and contract design processes with two objectives 1) bringing in greater understanding of realities of entrepreneurship and innovation; and 2) where size and/or significance of the investment justifies, getting access to technical expertise required to make sound investments.</p>

Lessons	Supporting findings and details
<p><b>I. Queensland Government should define key terms, measures/indicators and calculate baselines of key metrics prior to expending funding.</b></p>	<p>While the overarching objective of AQ has been to grow the knowledge economy, the term was not defined in sufficient detail to enable monitoring of its impact on the knowledge economy. This was partially corrected in 2019 when AQ Evaluation Framework was established, and baselines across key macro indicators were defined.</p> <p>If rolling out a similar program in the future, it is important to define which sectors make up the knowledge economy and how fast the knowledge economy would be expected to grow with or without AQ. This will assist evaluations and monitoring of the program.</p> <p>Knowledge economy weights should be updated when the 2021 Census data is released. Comparing the knowledge jobs in the 2021 Census with the 2016 Census will give much better accuracy of AQ impacts – the granularity needed to measure this with high accuracy is only in the five-yearly Census data.</p>
<p><b>J. Nous has developed novel measures to track innovation performance as part of this evaluation. The Queensland Government could continue to annually update and monitor these informative new measures.</b></p>	<p>In order to capture some the macro-level benefits driven by AQ, a number of ‘non-standard’ measurements were adopted to better separate AQ from other socioeconomic influences. These include a measure of scale ups based on payroll tax data, a definition of the “knowledge economy” GSP and jobs, and a Herfindahl-Hirschman Index of economic diversification by State, among others. Exact definitions, and justifications, for these metrics can be found within this report.</p> <p>To continue evaluating the effectiveness of the AQ initiative, and similar large scale future initiatives, the adoption of these (or equivalent) metrics will provide greater insight into their macro level impacts on the Queensland economy.</p>

# Appendix A Glossary

This appendix will provide a glossary of key terms, as they refer specifically to the AQ initiative and/or evaluation related and defined terminology.

## A.1 Key Terms

Term	Definition
<b>Budget</b>	<i>See A.3 AQ Performance and Implementation measures</i>
<b>Budgeted funds</b>	Funding that has been allocated to the AQ initiative, or an associated program, investment, or activity.
<b>Committed funds</b>	Funding that has been contractually committed but not yet spent.
<b>Contractual Commitments</b>	<i>See A.3 AQ Performance and Implementation measures</i>
<b>Event</b>	An event for external participants that is funded by, and/or supports AQ aims, objectives or programs.
<b>Expenditure</b>	<i>See A.3 AQ Performance and Implementation measures</i>
<b>Female</b>	In this evaluation, 'female' is used inclusively to describe stakeholders who identify with the 'female' sex category and 'women' gender identity. It is recognised that 'woman/women' may be seen as a more appropriate descriptor for gender identity but for the purposes of alignment with AQ reporting, the evaluation uses the 'female' descriptor.
<b>Funds Leveraged</b>	<i>See A.3 AQ Performance and Implementation measures</i>
<b>Grant</b>	Funding provided to defined entities for a specific purpose or project under a structured program which includes an application, assessment, decision, and funding agreement process.
<b>Jobs supported</b>	<i>See A.3 AQ Performance and Implementation measures</i>
<b>Knowledge Economy</b>	<i>See Appendix D.1.1 Definitions</i>
<b>Long-term</b>	Four to 11 years from implementation
<b>Medium-term</b>	One to four years from implementation
<b>Non-participant</b>	An entity that has not interacted with or participated in the AQ program.
<b>Participant</b>	An entity that interacted with AQ, either as event attendee, grant/program applicant, or recipient of funding or other services/opportunities. (Including if an application was unsuccessful).
<b>Partnership</b>	Financial contribution to one-off strategic projects or organisations to support unique opportunities.

Term	Definition
Priority groups	Entities (generally individuals and businesses) in which specific AQ programs are targeted towards. These are: females, Aboriginal and Torres Strait Islanders and those in regional and rural areas.
Programs	For the purposes of the report, each distinct AQ funding program or activity was termed program for simplicity.
Priority industries	Are industries identified by the Queensland Government as supporting growth and knowledge intensive jobs. These industries are: advanced manufacturing, aerospace, agriculture and food, biofutures, biomedical, defence, hydrogen, mining equipment, technology and services (METS), screen industry, resource recovery, and tourism.
Procurement	Obtaining goods or services in a fair and equitable manner that aligns with AQ strategic goals.
Recipient	See A.3 AQ Performance and Implementation measures
Regional	Outside of the greater Brisbane area
Scale-up	See D.1.1 Definitions
Short-term	Within 12 months from implementation
Sponsorship	Provision of financial support for an external event or activity
Total Commitments	See A.3 AQ Performance and Implementation measures

## A.2 Acronyms

### AQ Implementing Agencies

Acronym	Definition
DAF	Department of Agriculture and Fisheries
DES	Department of Environment and Science (includes Office of the Queensland Chief Scientist – OQCS)
DESBT	Department of Employment, Small Business and Training
DoE	Department of Education
DPC	Department of the Premier and Cabinet
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning
DTIS	Department of Tourism, Innovation and Sport

Acronym	Definition
Qld Health	Queensland Health
Qld Treasury	Queensland Treasury

## Other

Acronym	Definition
OQCE	Office of the Queensland Chief Entrepreneur
ABS	Australian Bureau of Statistics
ANZSCO	Australian and New Zealand Standard Classification of Occupations
ANZSIC	Australia and New Zealand Standard Industrial Classification
AQ	Advance Queensland
ARC	Australian Research Council
ARIP	Advancing Regional Innovation Program
ARIP	Advance Regional Innovation Program
ATSI	Aboriginal and Torres Strait Islander
BCR	Benefit-Cost Ratio
BERD	Business Expenditure on R&D
BLADE	Business Longitudinal Analysis Data Environment
CAGR	Compound Annual Growth Rate
CALD	Culturally and Linguistically diverse
CBA	Cost Benefit Analysis
CEO	Chief Executive Officer
CRM	Customer Relationship Management
DAWN	Data Assets Warehouse for Nous
FTE	Full-Time Equivalent
GDP	Gross Domestic Product
GERD	Gross Expenditure on R&D
GOVERD	Government Expenditure on R&D



Acronym	Definition
GSP	Gross State Product
HERD	Higher Education Expenditure on R&D
HHI	Herfindahl-Hirschman Index
HIDF	Hydrogen Industry Development Fund
IAC	Innovation Advisory Council
ICT	Information and Communications Technology
KLE	Key Line(s) of Enquiry
LABii	Longitudinal Australian Business Integrated Intelligence
METS	Mining Equipment, Technology and Services
MFP	Multifactor Productivity
NCRIS	National Collaborative Research Infrastructure Strategy
NPV	Net Present Value
OECD	Organisation for Economic Co-operation and Development
OQCE	Office of the Queensland Chief Entrepreneur
PISA	Programme for International Student Assessment
PRSS	Professional, Research and Scientific Services
R&D	Research and Development
SME	Small-to-Medium Enterprise
STEAM	Science, Technology, Engineering, Arts, and Maths
STEM	Science, Technology, Engineering, and Mathematics
TAFE	Technical and Further Education
VC	Venture Capital
VET	Vocational Education and Training
WAF	Women's Academic Fund
WRAP	Women's Research Assistance Program

## A.3 AQ Performance and Implementation measures

All AQ program managers are required to provide regular reports on a suite of key implementation and performance measures. The table below, taken from the AQ strategy and implementation document, outlines the framework under which AQ operated.

Table 7 | Whole-of-initiative measures and drill downs

Type	Measures (and drill-downs)	Definition
Implementation	<b>Program status</b>	
	• Programs launched	New AQ funded programs or activities launched.
	• Programs closed	AQ funded programs or activities that have closed and are no longer active.
	• Rounds opened	Funding round within existing AQ programs or activities that have opened for applications.
	• Events held	Individual events held which are directly related to and support programs funded by or sponsored through AQ, targeted at attendees from outside the Queensland Government. Including, but not limited to, launches, conferences, workshops, forums, and webinars.
	- <i>Regional events</i>	Events held outside of the Brisbane Advancing Regional Innovation Program (ARIP) region.
	- <i>Target groups</i>	Key focus audience for the event (e.g. young entrepreneurs, specific industry sector(s), general public, etc.)
	• Milestones and key activities	Major milestones or key activities, including but not limited to, major project milestones achieved, major contracts signed.
	<b>Program budget</b>	
	• Budget	Total Queensland Government AQ funds approved for the life of the program.
	• Expenditure	Actual total amount of Queensland Government funds expended for the program up to the end of any given reporting period.
	• Contractual commitments	Contractual commitments with funding recipients or service providers up to the end of any given reporting period.
	• Total commitments	Funds expended and contractually committed.

Performance	<b><i>Innovators reached</i></b>	
	• Applications received	Number of applications/entries/tenders received for AQ funding/other opportunities (e.g. grants, scholarships, partnership arrangements, procurement opportunities, competitions).
	• Attendance at events	Total number of attendees at AQ events. Numbers exclude public servants employed by State, Commonwealth and Local Government entities, attending as representatives of these entities.
	- <i>Regional attendees</i>	Number of attendees at events held outside of the Brisbane ARIP region.
	<b><i>Innovators supported</i></b>	
	• Recipients	Number of successful applications (individuals or organisations) of AQ funding or other opportunities (including, but not limited to, grant and scholarship recipients, successful tenderers, partnership opportunities, competition winners).
	- <i>Regional recipients</i>	Recipients who are located outside of the Brisbane ARIP region
	- <i>Female recipients</i>	Where an individual has identified as being female, or where the program's eligibility criteria requires the recipient to be female.
	- <i>Aboriginal and/or Torres Strait Islander recipients</i>	Where an individual recipient has identified as being Aboriginal and/or Torres Strait Islander, or where the program's eligibility criteria requires the recipient to be Aboriginal and/or Torres Strait Islander.
	<b><i>Funds leveraged</i></b>	
	• External investment leveraged	Total dollar investment contractually committed by sources outside the Queensland Government, including industry and investors. This may include cash equivalent contributions accepted as meeting initiative guidelines.
	<b><i>Jobs supported</i></b>	
	• New jobs reported	Number of jobs reported by recipients as having been established in Queensland as a direct result of AQ investment.
	• New jobs forecast	Additional Queensland jobs reported by recipients as forecast to be established in Queensland as a direct result of AQ investment.
	- <i>Regional jobs</i>	Number of jobs attributable to regionally-based recipients.

## Appendix B Key AQ Programs

The \$755 million AQ initiative is comprised of approximately 140 programs and activities delivered by nine government departments, approximately 40 of which are outlined below (totalling approximately \$650 million). While most programs contribute to more than one AQ Strategy, the table below provides an indication of the primary alignment, as identified by the relevant program leader.

Program	Description	Implementing Agency	Total AQ Budget	Primary AQ Strategy
<b>Aboriginal and Torres Strait Islander PhD Scholarships and Research Fellowships</b>	Supporting Aboriginal and/or Torres Strait Islander scholars in gaining a research PhD degree to lay the foundation for a future research career. Supporting PhD qualified Aboriginal and/or Torres Strait Islander researchers in undertaking original research that will benefit Queensland.	DTIS	\$0.63m	Building Capacity
<b>Advancing Regional Innovation Program</b>	Encourages innovation across Queensland and supports local economies to create jobs for regional Queenslanders.	DTIS	\$6.2m	Supporting Culture
<b>Artificial Intelligence Hub</b>	The AI Hub supports Queensland's innovation sector, businesses and startups through education, programs and bringing world-leaders in AI to Queensland as experts-in-residence. The AI Hub is managed by AI Consortium and located at The Precinct – the Queensland Government's innovation and investment hub known in Fortitude Valley, Brisbane.	DTIS	\$5m	Supporting culture
<b>AQ Industry Attraction Fund</b>	The AQ Industry Attraction Fund (AQIAF) is a financial incentive program designed to increase private sector investment and create jobs in Queensland. This program operated between 2016 and 2021.	DPC & Qld Treasury	\$150m	Increasing Investment
<b>AQ TAFE Pathways Scholarships</b>	The TAFE Pathways Scholarship Program aims to support access and equity students, including Aboriginal and/or Torres Strait Islander scholars, to undertake vocational training in science, technology, engineering, arts, and maths (STEAM) courses with a view to transitioning to a related university degree course.	DTIS	\$0.825m	Building Capacity
<b>Biofutures Commercialisation Program</b>	Supported bioindustrial experts to partner with Queensland researchers and businesses to scale-up and test new or improved	DTIS	\$3.77m	Increasing Investment

Program	Description	Implementing Agency	Total AQ Budget	Primary AQ Strategy
	technologies and processes at the pilot or demonstration scale.			
<b>Business Development Fund</b>	The Business Development Fund is designed to facilitate growth of Queensland's knowledge-based economy, "creating jobs and industries of the future". The Fund invests in Queensland businesses alongside private sector co-investors.	Qld Treasury	\$80m	Increasing Investment
<b>Business Growth Fund (formerly Accelerate Small Business Grants)</b>	The Business Growth Fund (BGF) provides a single upfront payment of up to \$50,000 for small and medium-sized businesses experiencing high-growth to buy specialised equipment.	DESBT	\$4.34m	Scale for Jobs and Growth
<b>Connecting with Asia Strategy</b>	The Connecting with Asia Strategy is a framework designed to make Queensland the leading Australian destination in market share, reputation, and experience delivery for Asian travellers.	DTIS	\$33m	Scale for Jobs and Growth
<b>Deadly Innovation</b>	The AQ Deadly Innovation Strategy seeks to deliver jobs and economic wealth for Aboriginal and Torres Strait Islander people. It creates pathways for Aboriginal and Torres Strait Islander businesses and innovators to turn their ideas into reality, so they can build wealth and create jobs.	DTIS	\$2.75m	Fostering Collaboration
<b>Engaging Queenslanders in Science Strategy and Activities</b>	The Engaging Queenslanders in science strategy 2021–24 has been developed to foster science engagement, participation, and innovation to help increase health, wealth, equity, sustainability, liveability, and prosperity. It includes a range of engagement and communication programs including: <ul style="list-style-type: none"> <li>the Partner Up Queensland program</li> <li>the Flying Scientists program</li> <li>the Queensland Women in STEM Prize</li> <li>the Queensland Young Tall Poppy Science Awards</li> <li>National Science Week events and activities.</li> </ul>	OQCS (DES)	\$1.62m	Supporting Culture
<b>Engaging Science Grants</b>	Supports events, activities and projects including citizen science projects that increase public participation in science. The grants are designed to assist teachers, scientists, organisations, citizen science groups	OQCS (DES)	\$1.32m	Supporting Culture

Program	Description	Implementing Agency	Total AQ Budget	Primary AQ Strategy
	and community groups deliver events and educational activities or conduct citizen science projects that tackle important issues in Queensland.			
<b>Female Founders Program</b>	The Female Founders Program is designed to support female-led businesses within Queensland during their initial stages, achieved via a series of sub-programs, including Evolve, Impact, Advisory Board and Spark.	DTIS	\$3.25m	Supporting Culture
<b>Growing Queensland's Companies</b>	Supported ambitious CEOs and executives of Queensland firms with high-growth potential to lead their businesses to the next level, improving profitability and performance.	DTIS	\$2.3m	Scale for Jobs and Growth
<b>Hot DesQ</b>	Hot DesQ invited start-ups to move to Queensland, Australia, by providing up to \$100,000 of equity free funding, free office space and assistance relocating. In return, these companies are required to give back to the community (e.g. mentoring a local company) through a points system.	DTIS	\$6.14m	Fostering Collaboration
<b>Ignite Ideas Fund</b>	The Ignite Ideas Fund is an approximately \$50 million fund designed to support high-growth business undertaking commercialisation projects. This fund contains two tiers of support, depending on the timeframe required for commercialisation.	DTIS	\$53.5m	Increasing Investment
<b>Industry Research Fellowships</b>	The AQ Industry Research Fellowships program supports researchers partnering with industry to complete original research that will have a positive impact on Queensland, including Research Fellowships, Defence CRC Research Fellowships, and Industry Research Fellowships. This is achieved via the provision of two tiers of fellowship funding to eligible researchers.	DTIS	\$44.1m	Building Capacity
<b>Innovation Partnerships</b>	A suite of investments that support commercialisation of research and/or innovation into tangible products and services for the Queensland economy.	DTIS	\$15.15m	Scale for Jobs and Growth
<b>Innovation Partnerships Grants</b>	Innovation Partnerships Grants were designed to assist Queensland-based research organisations and end-user organisations to undertake mission-driven, collaborative R&D projects. This is achieved via the provision of	DTIS	\$15.8m	Scale for Jobs and Growth

Program	Description	Implementing Agency	Total AQ Budget	Primary AQ Strategy
	grants up to \$1.5m for projects with a duration of up to three years.			
<b>Integrated Care Innovation Fund</b>	The Integrated Care Innovation Fund was a state-wide initiative enabling Hospital and Health Services and Primary Health Networks across Queensland to develop and progress new models of care and innovative approaches to integrated service delivery.	Qld Health	\$35m	Increasing Investment
<b>JCU Ideas Lab</b>	The purpose-built lab has been funded by the Queensland Government, Australian Government and James Cook University with equal contributions of \$10 million.	Qld Treasury	\$10m	Fostering Collaboration
<b>Knowledge Transfer Partnerships</b>	The Knowledge Transfer Partnerships program supported collaboration and knowledge transfer by enabling small and medium size businesses to partner with universities to select graduates for specific projects in the businesses. Grants of up to \$50,000 (excluding GST) per project are available for businesses to employ graduates on strategic innovation projects for up to 12 months.	DTIS	\$3.9m	Fostering Collaboration
<b>Mentoring for Growth Program</b>	Mentoring for Growth (M4G) program provides eligible businesses with free access to volunteer business experts who provide insights, options and suggestions relating to challenges and opportunities experienced by Queensland businesses. The M4G program includes Mentoring for Growth sessions, Mentoring for Investment, Mentoring for Pitch, Mentoring for Export and Mentoring for Recovery.	DESBT	\$1.22m	Scale for Jobs and Growth
<b>Office of the Queensland Chief Entrepreneur</b>	The Office of the Queensland Chief Entrepreneur (OQCE) is the first of its kind in Australia with a strong goal – to accelerate Queensland through innovation and entrepreneurship.  The OQCE plays a vital role in building and promoting the importance and contribution of entrepreneurship and investment in Queensland.	DTIS/DPC	\$6.4m	Building Capacity
<b>Priority Industry Roadmaps</b>	Ten-year roadmaps and action plans have been developed for priority industries emerging and priority sectors with global growth potential: <ul style="list-style-type: none"> <li>Advanced manufacturing</li> <li>Biofutures</li> </ul>	DSDILGP	\$38.3m	Scale for Jobs and Growth

Program	Description	Implementing Agency	Total AQ Budget	Primary AQ Strategy
	<ul style="list-style-type: none"> <li>• Biomedical and Life Sciences</li> <li>• Defence and Aerospace</li> <li>• Mining equipment, technology, and services (METS)</li> </ul>			
<b>Queensland Genomics Health Alliance</b>	The Queensland Genomics Health Alliance aimed to integrate genomics into Queensland's healthcare system, with an objective "to demonstrate the value of genomic medicine in everyday Queensland healthcare". This investment led to the establishment of the Queensland Genomics Health Alliance (Queensland Genomics).	Qld Health	\$25m	Increasing Investment
<b>Queensland Government Research Infrastructure Co-Investment Fund</b>	Attracting critical co-investment in National Collaborative Research Infrastructure Strategy (NCRIS) capabilities with existing or planned Queensland operations.	DTIS	\$25m	Increasing Investment
<b>Queensland Hydrogen Industry Development Strategy and Fund</b>	<p>The Queensland Hydrogen Industry Development Strategy supports the development of a sustainable hydrogen industry in Queensland.</p> <p>The Hydrogen Industry Development Fund (HIDF) to drive investment and accelerate development of hydrogen projects in Queensland.</p>	DSDILGP	\$28m	Scale for Jobs and Growth
<b>Queensland Startup Events and Activities Fund</b>	The fund-built capability within Queensland's start-up community with funding of up to 50% of total activity costs.	DTIS	\$1.92m	Supporting Culture
<b>Regional Futures</b>	<p>Launched in 2021, Regional Futures aims to accelerate regional economic growth through innovation through three key strategies:</p> <ul style="list-style-type: none"> <li>• Collaborative Projects: Provides grants of up to \$200,000 to collaborative projects that look to develop tangible solutions to address a pressing regional innovation challenge.</li> <li>• Ecosystem Development: direct support for local innovation leaders to strengthen local networks and connections, grow investment, and help build new jobs in current and emerging industries.</li> <li>• Events and Activations: bringing regions together and promoting Queensland's innovation community, their achievements, and competitive strengths.</li> </ul>	DTIS	\$5m	Scale for Jobs and Growth



Program	Description	Implementing Agency	Total AQ Budget	Primary AQ Strategy
<b>Small Business Digital Grants</b>	The Small Business Digital Grants are a 50% funding contribution of up to \$10,000 for small Queensland based businesses to improve digital capabilities, work smarter and take advantage of online business opportunities.	DESBT	\$7.23m	Scale for Jobs and Growth
<b>Small Business Entrepreneur Grants</b>	The Small Business Entrepreneur Grants are a 50% funding contribution of up to \$5,000 for small Queensland based businesses to newly started small businesses to enable them to access professional advice and support in the critical early stages of establishing a business.	DESBT	\$3.4m	Scale for Jobs and Growth
<b>Technology Commercialisation Fund Project</b>	A pilot project which aimed to grow jobs and create new economic activity in regional Queensland from the commercialisation of intellectual property owned by DAF and its research partners.	DAF	\$2.78m	Increasing Investment
<b>The Precinct</b>	The Precinct, founded by AQ, is an innovation hub connecting Queensland startups, scaleups, incubators, investors, and mentors under one roof in Fortitude Valley, Brisbane.	DTIS	\$18.83m	Fostering Collaboration
<b>UQ COVID-19 Vaccine</b>	Funding provided in March 2020 to support the development of a COVID-19 vaccine under development by the University of Queensland's School of Chemistry and Molecular Biosciences.	DTIS	\$10.25m	Building Capacity
<b>Women's Research Assistance Program (and Women's Academic Fund)</b>	The AQ Women's Research Assistance Program supported women in maintaining their research careers and consequently encourage retention of female researchers in their chosen profession in Queensland.	DTIS	\$2.89m	Building Capacity
<b>Young Starters Fund and Competition</b>	<p>The Young Starters' Fund was designed to build, attract, and retain young entrepreneurial talent, and build entrepreneurial and startup skills in young Queenslanders.</p> <p>The Young Starters' Competition helped young people connect with leading innovators, develop business skills, and get a startup idea ready for investors.</p>	DTIS	\$0.46m	Supporting Culture

# Appendix C Program logic

CONTEXT	STRATEGIES & OBJECTIVES	INPUTS	ACTIVITIES & OUTPUTS	SHORT TERM OUTCOMES	MEDIUM TERM OUTCOMES	LONG TERM OUTCOMES
<p>Advance Queensland aims to create better future for all Queenslanders by investing in innovation to ensure Queensland's economy is strong, diversified and resilient.</p> <p>Advance Queensland is made up of 140 programs and activities delivered by nine Queensland Government departments in partnership with industry, businesses, universities, startups, investors and the Queensland Chief Entrepreneur.</p>	<p>Supporting culture: SC1 – Increase innovation awareness and engagement</p>	<p>\$755m funding</p> <p>AQ delivery &amp; governance staff and resources</p>	<p>Grants – funding provided to defined entities for a specific purpose or project under a structured program which includes an application, assessment, decision, and funding agreement process</p> <p>Partnerships – financial contribution to one-off strategic projects or organisations to support unique opportunities</p>	<p>Queenslanders have high awareness of innovation and science</p>	<p>Queenslanders have high level of interest in science and innovation</p> <p>Queensland has a strong reputation as a knowledge economy</p> <p>Queenslanders in knowledge jobs are less likely to move interstate and internationally</p>	<p>Queenslanders are engaged in science and innovation</p> <p>Queensland is attracting workers into knowledge jobs from other states and internationally</p>
	<p>Supporting culture: SC2 – Increase entrepreneurialism</p>		<p>Competitions – a contest in which people or companies take part in order to win a defined end-prize</p>	<p>Queenslanders have high awareness and interest in entrepreneurialism</p> <p>Queensland has systems to support entrepreneurial activity</p>	<p>Queenslanders are highly engaged in entrepreneurial activities</p> <p>Queensland has more new start-ups</p>	<p>Queensland has clusters of strong entrepreneurial activity, including in knowledge industries</p> <p>Queensland's start-ups grow faster and fail less often</p>
	<p>Building capability: BC1 – Increase innovation capability</p>		<p>Procurement – obtaining goods or services in a fair and equitable manner that aligns with Advance Queensland strategic goals</p> <p>Events – an event for external participants that is funded by, and/or supports Advance Queensland aims, objectives or programs</p>	<p>Queensland businesses are better equipped to undertake innovation activity</p> <p>Queensland researchers are better equipped to solve global challenges</p>	<p>Queensland businesses and researchers are more productive in their research and innovation activities</p>	<p>Queensland businesses are successful in increasing market share through innovative products</p>
	<p>Building capability: BC2 – Develop, attract and retain talented people (including STEM skills)</p>		<p>Sponsorships – provision of financial support for an external event or activity</p> <p>Foundations and administrative activities – activities to support the delivery and governance of the initiative</p>	<p>More Queensland students are interested and enrolled in STEM education</p> <p>Queensland attracts, develops and retains research talent</p>	<p>More Queensland population holds higher level qualifications (including STEM)</p> <p>Queenslanders are better at STEM</p>	<p>Queensland has interstate/international reputation for its strong research talent pool</p> <p>More of the Queensland population works in knowledge intensive industries</p> <p>Queensland has more research-focused jobs (in research institutes and businesses)</p>

Sources: frs\_guidelines (pg 16, 29), POP activity workplan, FRC activity work plan, SCASP activity work plan

CONTEXT	STRATEGIES & OBJECTIVES	INPUTS	ACTIVITIES & OUTPUTS	SHORT TERM OUTCOMES	MEDIUM TERM OUTCOMES	LONG TERM OUTCOMES
<p>Advance Queensland aims to create better future for all Queenslanders by investing in innovation to ensure Queensland's economy is strong, diversified and resilient.</p> <p>Advance Queensland is made up of 140 programs and activities delivered by nine Queensland Government departments in partnership with industry, businesses, universities, startups, investors and the Queensland Chief Entrepreneur.</p>	Fostering Collaboration: FC1 – Build sustainable partnership to deliver outcomes	<p>\$755m funding</p> <p>AQ delivery &amp; governance staff and resources</p>	Grants – funding provided to defined entities for a specific purpose or project under a structured program which includes an application, assessment, decision, and funding agreement process	Queensland businesses and researchers increasingly connect more often nationally and globally when working on innovative activities	Queensland businesses and researcher collaborations are growing and varied (business to business, business to research, research to research)	Queensland businesses and researchers build strong and high value partnerships with a range of partners  Queensland exports in knowledge intensive industries are growing
	Fostering Collaboration: FC2 – Increase local and international networks		Partnerships – financial contribution to one-off strategic projects or organisations to support unique opportunities	Systems, events and supports are in place across Queensland to connect businesses and researchers working on similar problems	Knowledge intensive business and research activity in Queensland is attracting foreign investment	Queensland businesses and researchers have strong local, national and international networks of partners
	Increase Investment: II1 – Grow pipeline of investible products and services		Competitions – a contest in which people or companies take part in order to win a defined end-prize	Queensland businesses spend more on R&D activities Queensland businesses invest more on initiatives to increase productivity (incl. business process innovation and technology)	Queensland businesses attract more investment for innovative activities There is more large and quickly growing startups (“unicorns”)	More capital is re-invested in facilities and systems to support more innovation in the future (e.g. precincts)
	Increase investment: II2 – Build access to capital		Procurement – obtaining goods or services in a fair and equitable manner that aligns with Advance Queensland strategic goals	Number of Queensland start-ups attracting external investment is higher Queensland built a strong base, including systems and events for venture capital industry	Value of venture capital investments in Queensland businesses grows Venture capital activity in Queensland grows	Queensland businesses have access to strong and diversified capital markets (angel investors, venture capitalists)
	Scaling for jobs and growth: SJ1 – Expedite commercialisation		Events – an event for external participants that is funded by, and/or supports Advance Queensland aims, objectives or programs	Efficiency and speed to market of products, processes and systems increased	Value of Queensland products, processes and systems originating from research activities increases	Commercialisation of products, processes and systems occurs in larger portion and more often in Queensland
	Scaling for jobs and growth: SJ2 – Increase economic benefits from innovation		Sponsorships – provision of financial support for an external event or activity  Foundations and administrative activities – activities to support the delivery and governance of the initiative	Queensland businesses in knowledge economy are more productive and profitable	Number of knowledge intensive jobs in Queensland is increased	Queensland's economic growth, productivity, flexibility and resilience is increased

Sources: frs\_guidelines (pg 16, 29), POP activity workplan, FRC activity work plan, SCASP activity work plan

# Appendix D Detailed methodology (excluding CBA)

This appendix will provide further detail on the methodology that has informed the interim report and clearly state data limitations.

## D.1 Approach

The reach, impact and effectiveness of AQ has been measured by reviewing performance against the stated indicators from the evaluation plan and the cost benefit analysis will measure the material outcomes for Queensland and how cost-effective they have been. The former analysis will feed into the latter, and both will require analysis against benchmarks or a comparator group to establish what would have happened without AQ, and thus the out-performance attributable to AQ.

Given the vast range of impacts that AQ could have on businesses, industry, research sector and the economy of Queensland, we have aimed to approach this analysis in an agile and iterative way. We have been guided by relevance and accessibility of indicators and have investigated and used alternatives where indicators have shown little insight.

Nous has collected quantitative data from a range of sources such as documents and literature; program data and other data made available by relevant government agencies; publicly available datasets and an AQ survey. Qualitative data has been sourced from interviews and focus groups with key AQ stakeholders and participants, alongside feedback provided within the AQ survey.

A collaborative approach was used to co-develop the methodology. This was achieved through the establishment of a Working Group made up of the DTIS evaluation team, Nous evaluation team and technical advisors from Queensland Treasury and Department of State Development, Infrastructure, Local Government and Planning. This Working Group provided guidance and advice on the scope of the evaluation, methodology design and review of evaluation report drafts.

The DTIS evaluation team facilitated engagement and consultation with implementing agencies, key internal and external stakeholders for their input in all three stages of this evaluation. The Nous evaluation team worked closely with DTIS to co-ordinate data requests and access.

### D.1.1 Definitions

The evaluation team has been using publicly available and agreed definitions of concepts where agreed and practical. In some cases, a definition for the purposes of the evaluation had to be agreed on. These definitions have been summarised below.

#### Defining 'Scale-ups'

'Scale-ups' have been defined as a company that has grown to a payroll of more than \$10 million, noting that this is different to the usual market capitalisation definition of a large startup, and reflective of the size of businesses in Australia.

- Entities that consistently had Queensland taxable wages greater than \$10 million across the last decade have been excluded (this removed large corporates like Coles and Woolworths.)
- Based on the methodology suggested by Nous, entities were flagged in the analysis if:

- Total Queensland taxable wages were over \$10 million for current financial year and less than \$10 million for previous financial year (i.e. 2017-18 vs 2016-17, 2016-17 vs 2015-16 etc.); or
- Yearly increment in the total Queensland taxable wages was more than \$10 million when comparing current financial year with previous financial year (i.e. 2017-18 vs 2016-17, 2016-17 vs 2015-16 etc.)
- Due to data limitations, analysis on whether entities had been merged or acquired was not included.
- Due to confidentiality, details of the entities and their wages information were withheld.

### Defining the knowledge economy

While AQ was targeted towards growing the 'knowledge' economy and 'knowledge' jobs, a detailed statistical definition (i.e. taxonomy or concordance) of what constitutes the 'knowledge' economy/jobs was not established at the time (although the general concept was described). Nous has developed a definition in consultation with Queensland Government to help measure the knowledge economy.

A worker can be classified statistically by their type of job, or the industry they work in. For example, a truck driver or cleaner working for a pharmaceutical company, or an agronomist or CEO in the agriculture industry. So not all 'knowledge jobs' are in 'knowledge industries' and vice versa not all people working in 'knowledge industries' are doing 'knowledge jobs'.

There are numerous statistical classifications that can be useful to define the knowledge economy. The two predominant are defining knowledge intensive industries (using ANZSIC – industries such as professional and technical services industries) or knowledge intensive occupations (using ANZSCO, such as scientific or managerial occupations). For the purposes of this evaluation, we will use a hybrid approach that weights different ANZSIC codes by their proportion of relevant ANZSCO codes, with some manual adjustments to give full weight or no weight to certain sectors that were or were not the explicit focus of AQ. The weighting given to an industry will determine its prevalence in our calculations of the knowledge economy when measuring the outcomes of AQ. Table 8 outlines the ANZSCO groups that were included to the analysis of 2016 ABS Census data to calculate the knowledge weighting of the industry.

The following lists have been informed by the definitions document supplied by the Department, including definitions of 'knowledge intensive service exports' and 'knowledge occupations' used by Queensland Treasury. DTIS and Nous received guidance from Queensland Treasury and Department of State Development, Infrastructure, Local Government and Planning about the definition below through a consultation meeting held on 18 October 2021.

**Table 8 | Definition of knowledge workers by ANZSCO groups**

Major Occupation Group	Sub-major occupation groups
MANAGERS	Chief Executives, General Managers and Legislators Farmers and Farm Managers Specialist Managers Hospitality, Retail and Service Managers
PROFESSIONALS	Arts and Media Professionals Business, Human Resource and Marketing Professionals Design, Engineering, Science and Transport Professionals Education Professionals Health Professionals ICT Professionals Legal, Social and Welfare Professionals
TECHNICIANS AND TRADES WORKERS	Engineering, ICT and Science Technicians
COMMUNITY AND PERSONAL SERVICE WORKERS	Health and Welfare Support Workers
CLERICAL AND ADMINISTRATIVE WORKERS	Office Managers and Program Administrators

Source: Queensland Treasury

**Table 9 | Weighting by ANZIC Division**

Division	Title	Weighting	Justification
C	Manufacturing	100%	A focus of AQ that would be underrepresented if just accounted for by proportion of knowledge workers due to its focus on capital.
M	Professional, Scientific and Technical Services	100%	Traditionally considered a knowledge sector (e.g. in the Lerner Report)
J	Information Media and Telecommunications	100%	Traditionally considered a knowledge sector (e.g. in the Lerner Report)
A	Agriculture, Forestry and Fishing	8%	Proportion of industry represented by knowledge workers (see Table 8 for definition) used to weight the industry by its amount of knowledge workers.
B	Mining Services (i.e. only 109 Other Mining Support Services part of mining)	32%	
D	Electricity, Gas, Water and Waste Services	39%	
E	Construction	23%	
F	Wholesale Trade	33%	
G	Retail Trade	20%	
H	Accommodation and Food Services	19%	
I	Transport, Postal and Warehousing	21%	
K	Financial and Insurance Services	47%	
L	Rental, Hiring and Real Estate Services	26%	
N	Administrative and Support Services	22%	
O	Public Administration and Safety	42%	
P	Education and Training	66%	
Q	Health Care and Social Assistance	56%	
R	Arts and Recreation Services	36%	
S	Sum of Other Services	20%	
B	Mining (except 109 Other Mining Support Services)	0%	To reduce the impact on the data that may result from Mining's size and variability due to changes in resource prices, and it was not a focus of AQ. Note that while there are some management, engineering and science staff working in mining, including mining figures would mask the trends we are trying to measure.

Source: Nous

## D.1.2 Comparator groups

Comparison Group	Justification
<b>National Comparators</b>	
National Comparators	<p>Western Australian, which will be considered the 'closest' counterfactual for this report, is similar to Queensland in a number of significant metrics. Including (but not limited to):</p> <ul style="list-style-type: none"> <li>• similar industry composition (large resource sector)</li> <li>• similar economic size</li> <li>• similar mining boom (prior to AQ) and COVID-19 impact (towards the end of AQ)</li> <li>• no or limited public investment in innovation programs similar to AQ.</li> </ul>
Western Australia	<p>In addition to this, Western Australia has also seen a limited investment in innovation in comparison to Queensland. Because of this and the above similarities, Western Australia provides a 'what could have been' counterfactual to compare against Queensland. It is not suggested that Queensland would entirely resemble Western Australia in the absence of AQ, but that Queensland may have followed a path similar to Western Australia in the absence of innovation initiatives such as AQ. For these reasons, Western Australia has been used as the benchmark for several pieces of analysis.</p>
New South Wales	<p>New South Wales is the largest state by GSP, constituting nearly one third of the national economy. The state is often considered a leading metric due to the size and level of private investment attraction.</p> <p>In addition to significant private investment, the state government has made additional public investments in innovation, including the \$190 million <i>Jobs for NSW</i> fund 'centred on attracting large international companies to set up shop in the state, providing funding for local and regional SMEs and accelerating the growth of startups'.</p>
Victoria	<p>Victoria is the second largest state by GSP, and forms a key comparator state for Queensland due to its large level of public investment in innovation.</p> <p>Innovation investment by the Victoria government is similar in scale to Spending by Queensland. In the years surrounding AQ's operation, Victoria spent approximately \$864 million on similar programs via the <i>Premier's Jobs and Investment Fund</i>, the <i>Regional Jobs and Infrastructure Fund</i> and the <i>Future Industries Fund</i>. This positions Victoria as a strong 'benchmark state' to aid in evaluating the effectiveness of AQ.</p>
South Australia	<p>The South Australian economy is significantly smaller than the other Australian comparator groups but is regarded for having a strong innovation and research base, focusing on Defence and Aerospace.</p>
<b>International Comparators</b>	
International comparators should be taken as indicative only and are used infrequently within this report. See 3.3 <i>Key limitations</i> .	
New Zealand	<p>New Zealand provides the 'most similar' non-Australian comparison. Consisting of a similar population, economic size and level of industrial development.</p>



Comparison Group	Justification
	<p>Innovation policy and development in New Zealand lags behind both Australia and many OECD countries.<sup>94</sup> Providing a 'quasi control group' of a environment without a major innovation focus.</p>
Israel	<p>Israel forms the 'gold standard' of innovation, with a strong focus on developing innovative technology and encouraging external investment into the nation.</p> <p>Israel has a strong innovation focus with a major emphasis on grant programs for seed funding and early-stage projects. In 2019, the Israel Innovation Authority spent approximately A\$750 million on grant programs. While this spending significantly outstrips the scale of the AQ program, it allows for insight into the impact of a strong innovation focus.</p>

Source: Nous

<sup>94</sup> *Innovation Policy Platform*. 2016. 'New Zealand – STI Outlook Country Profile'

## D.2 Primary data sources

### D.2.1 Survey

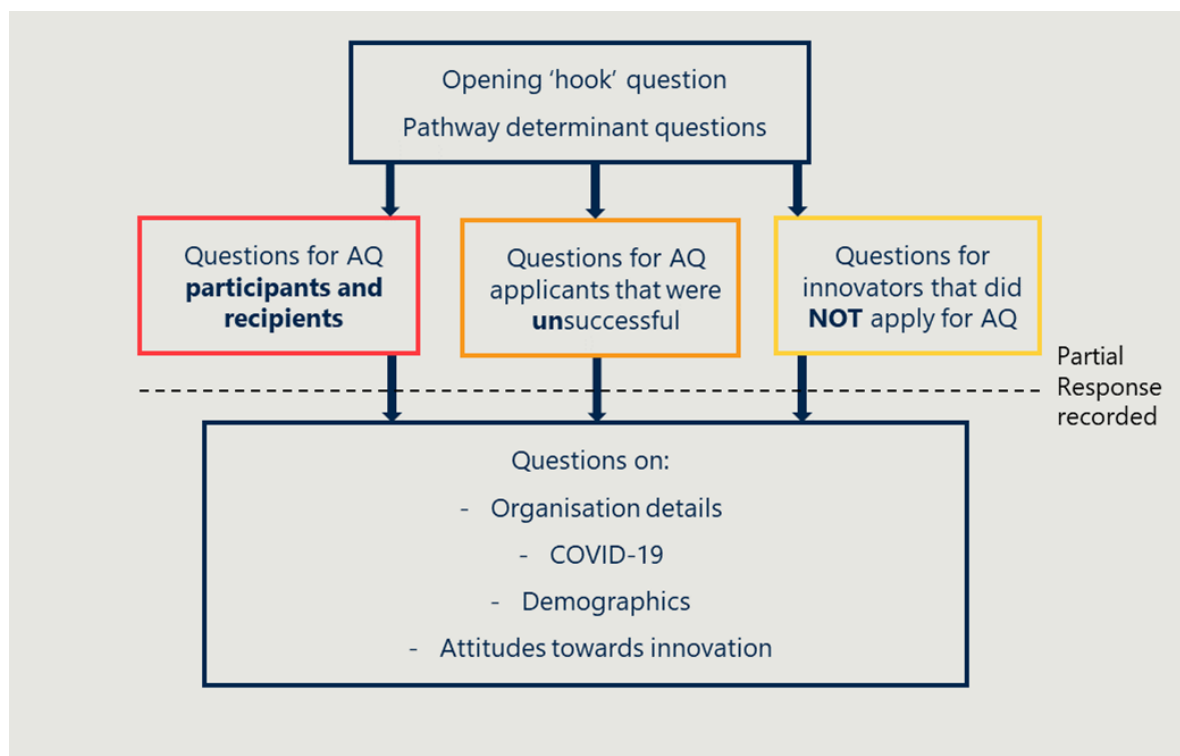
Nous conducted a survey of Queensland residents and businesses to more closely understand the impact of AQ and fill data gaps.

#### Survey Design

Evaluation team paid careful attention to survey design to facilitate high response rate. Some of the considerations included:

- sending the survey link from a trusted source;
- anonymising the responses, so that stakeholders felt comfortable completing sensitive information about their organisation;
- constructing detailed survey logic to tailor questions to each respondent depending on:
  - Respondent entity type: Startup & entrepreneur, business or company, university and research institutions (including researchers), investor, Local Government and Other (including schools)
  - Respondent's AQ status: non-participants, successful or unsuccessful applicant
- allowing optional responses to questions to prevent 'drop-outs' due to unwillingness to respond to questions;
- Checkpointing of responses as partial and complete to account for unwillingness to respond to demographic or organisational related questions.

Figure 51 | Visual representation of survey logical structure



## The survey was sent to a diverse group of stakeholders to ensure a representative pool was established

To effectively evaluate the impact AQ, we sent the survey to multiple types of stakeholders, including:

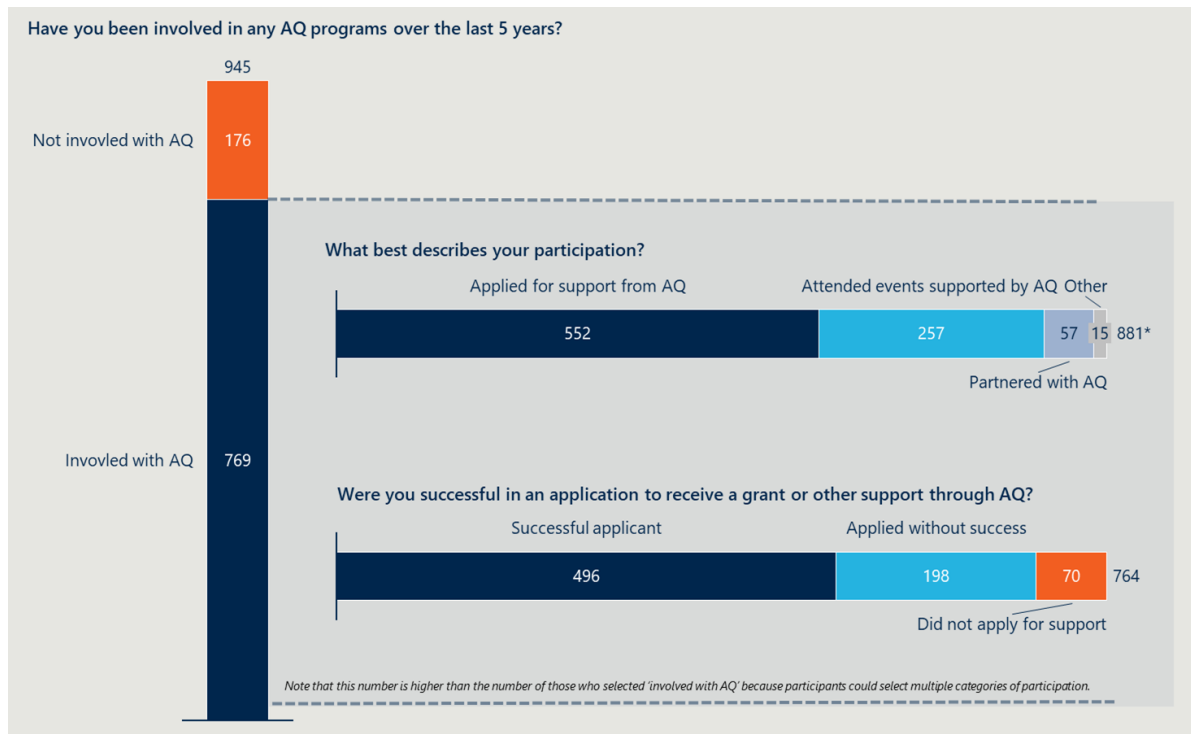
- **those who applied to receive AQ funding:** the survey was sent to the full list of those who had applied for AQ funding in the past, including those who were successful (recipients) and those who were unsuccessful (participants) in receiving funding.
- **those who hadn't applied for AQ funding:** the survey was also sent to those who had not applied to receive AQ funding (non-participants). This group was comprised of those who DTIS and the Office of the Chief Entrepreneur had on their mailing list as those who were generally involved or interested in the innovation ecosystem.

Approximately 27,000 people received the link to the survey.

## Survey response

The survey covered approximately 40 questions on motivations, benefits, and impacts of COVID-19. A total of 1,254 responses were recorded, of which 945 were validated and analysed (809 complete responses and 136 partial responses). Owing to the optional nature of questions, the validation process checked for 'completeness' to ensure that blank 'skip-through' responses were not recorded, in addition to discarding responses that failed to reach the 'partial response' threshold (see Figure 51). Resulting in the exclusion of 309 invalid responses, leaving 945 validated responses. Equating to an approximate response rate of 3.5 per cent, with responses from stakeholders across 30 sectors and six major stakeholder groups. It should be noted that while 945 responses have been validated and analysed, the optional nature of questions means that individual question response numbers can vary.

Figure 52 | Summary of survey responses by level of involvement with AQ



## D.2.2 Conducted stakeholder consultations

Provided below is the list of stakeholder engagements that have informed this report.

Table 10 | Stakeholder consultations

Engagement Type	Organisation	Person/group
Interview	Queensland Treasury	Assistant Under Treasurer, Industry Policy Director, Economic Policy Principal Treasury Analyst, Social Policy
Interview	DPC	Executive Director, Economic Policy A/Director, Economic Policy
Interview	DES	Deputy Director-General, Science and Technology
Interview	DTIS	Deputy Director-General, Innovation
Interview	DSDILGP	Deputy Director-General, State Development Group
Interview	DESBT	Deputy Director-General, Strategy
Interview	DTIS	Deadly Innovation Program Leader Manager, Program Design and Insights
Interview	DSDILGP	Director, Industry Development
Interview	Queensland Chief Scientist	Hugh Possingham
Interview	IAC member	Bronwyn Harch
Interview	IAC member	Aaron Birkby
Interview	IAC member	Monica Bradly
Interview	IAC member	Rowena Barrett
Interview	BIRG member	Leesa Watego
Interview	BIRG member	Julie-Ann Lambourne
Interview	University of Queensland	Kylie Cooper
Focus Group		Indigenous innovators and entrepreneurs
Focus Groups x2	AQ implementing agencies	AQ Program leads, administrators and managers
Focus Group		Regional and rural innovators and entrepreneurs
Focus Group		Female innovators and entrepreneurs

Engagement Type	Organisation	Person/group
Focus Group		Priority Industries
Group Interview	DTIS, DES	Program Leaders - Infrastructure
Focus Group		Infrastructure
Group Interview	DTIS, OQCS	Program Leaders – Supporting Culture
Focus Group		Supporting Culture
Group Interview	DTIS, DES	Program Leaders - Collaboration
Focus Group		Collaboration
Group Interview	DTIS, Treasury	Program Leaders – Increasing Investment
Focus Group		Increasing Investment
Group interview	OQCE	Chief Scientist Director, Office of the Chief Scientist

## D.3 Secondary data sources

Data for the interim report was collected from a range of secondary data sources. In instances where references for secondary data sources are not listed within footnotes, they are available below.

### D.3.1 Secondary data

Data Source	Explanation
ABS	Publicly available data, statistics and reports from the Australian Bureau of Statistics were used to measure insights into state and Australian economic and industry performance.
AQ program data	Program data collected and managed by DTIS on behalf of all implementing agencies for performance reporting purposes.
BLADE	An economic data tool combining tax, trade and intellectual property data with information from ABS surveys to provide a better understanding of the Australian economy and businesses performance over time. <sup>95</sup> Due to the confidential nature of BALDE data, full access to the database was not made available. Requests for data slices were sent by Nous to DTIS, which conducted the data search and extraction in the ABS Datalab. Data was used to gain insights on economic, industry and business performances that are not public domain.
Queensland Treasury	Data from the Queensland Treasury Office of State Revenue payroll tax database was requested by Nous. This request was designed to allow Nous to investigate the change

<sup>95</sup> Australian Bureau of Statistics. 2021. 'Business Longitudinal Analysis Data Environment (BLADE)'

Data Source	Explanation
	<p>in the number of 'Scale-ups' that may have been influenced by the AQ program. Due to the confidential nature of payroll tax data, the scale-up criteria definition in D.1.1 Definitions was provided to the treasury, who returned the number of scale-up events per year. DTIS facilitated and co-ordinated access this data.</p>
LABii	<p>LABii is Longitudinal Australian Business Integrated Intelligence DataVault, comprised of separate public and non-public datasets like the Australian Business Register, Intellectual Properties Australia (register on patents, trademarks, design and plant breeder), Mergers and Acquisitions data, listings of the Australian Stock Exchange, amongst others.<sup>96</sup></p> <p><i>It should be noted that Nous has not been provided with full access to this Datavault, but we have been able to submit data requests to DTIS to extract and slicedata from LABii.</i></p>
Data Assets Warehouse for Nous (DAWN)	<p>DAWN is Nous' proprietary data warehouse to enable us to quickly produce insightful analysis. DAWN has been developed over two years by Nous' Data and Analytics team, contains socio-economic and human capital data that provides rich insights into the labour market and the economy. This includes data on job advertisements, the relationship between fields of education and advertised roles and historical employment data and Nous' employment forecasts to 2023 by state, occupation and industry.</p>

<sup>96</sup> Queensland University of Technology, 2021, 'Longitudinal Australian Business Integrated Intelligence (LABii)'

# Appendix E CBA technical appendix

This CBA Technical Appendix provides a more detailed account of the CBA approach and methodology presented earlier. While it is necessary to make some assumptions based on experience and the literature, to estimate the benefits attributable to AQ, these have been done transparently and conservatively. References to specific figures are therefore drawn from the lowest end of the central case range unless stated otherwise (see Figure 3).

## E.1 Approach to estimating the benefits of AQ

Nous has adopted three approaches to estimate benefits, the average of these three metrics results in the summative NPV benefit for AQ. This helps reduce the sensitivity attributable to various assumptions made.

### Approach 1: Productivity increase

The main macro-level benefit of AQ for Queenslanders is productivity, in the broadest sense. This is because AQ enables Queensland to produce better outcomes (higher living standards) for a given amount of inputs of labour and capital. Therefore, one approach to calculating this macro-CBA was to determine the productivity uplift attributable to AQ.

This approach results in a NPV benefit to AQ of \$2.19 billion and a range of \$2.09 billion to \$2.32 billion.

### Step one – estimate the productivity uplift in the Queensland knowledge economy attributable to AQ

Given the lag typically associated with changes in productivity and the relatively short number of years AQ has existed, Nous has supplemented analysis of data with literature research on similar innovation initiatives to determine appropriate productivity uplift estimates.<sup>97</sup> The literature indicates that previous large-scale investment in innovation has generated 0.03 percentage points to GDP growth annually. The method uses an increase in the productivity of the knowledge economy of 0.03 percentage points per annum from 2016-17 to 2020-21, cumulating to 0.15 per cent to 2029-30.<sup>98</sup> Note that the 0.1 per cent increase in productivity is a conservative assumption and it continuing till 2029-30 (or five years after investment finished, when remaining committed funds are spent by 2024-25) is a common assumption of benefits lag in innovation policy (i.e. after five years it is assumed that no benefits attributable to AQ will remain).

### Step two – estimate the increase in living standards attributable to AQ up till 2020-21

To estimate the increase in living standards attributable to AQ, we applied the productivity uplift to real GSP of the knowledge economy (KE) subset of the Queensland economy. Note that KE GSP is made up (essentially) of wages plus profits, so GSP captures both the increased profits (say) to small business owners and entrepreneurs, and also the increased earnings paid to (say) more skilled workers in those sectors, due to AQ. We assumed a one-year lag from the beginning of AQ (starting on 1 July 2015), before first tangible benefits start to accrue in 2016-17, and then ramping up to 2020-21 in 0.03 percentage point increments - so another four years to see benefits coming through fully (Table 11).

<sup>97</sup> <https://acilallen.com.au/uploads/projects/89/acgcrsprogramreview2012.pdf>

<sup>98</sup> Conservative assumption. Growth is likely to be higher than 0.15% as AQ expenditure continues (i.e. contractual commitments that have not yet been expended) to 2024, with benefits continuing 5 years after that. Normally for physical infrastructure (roads and bridges, hospitals) benefits are forecasted for 40-50 years. But in innovation/IT policy, 5 years is relatively standard practice.

**Table 11 | Estimated increase in living standards from 2016-17 till 2020-21<sup>99</sup>**

BENEFITS	2016-17	2017-18	2018-19	2019-20	2020-21
Knowledge economy GSP (\$, billions, real, chain volume index)	\$120	\$124	\$126	\$126	\$130
Productivity uplift (% MFP uplift attributable to AQ)	0.03%	0.06%	0.09%	0.12%	0.15%
Increase in living standards (\$, billions, real, chain volume index)	\$0.04	\$0.07	\$0.11	\$0.15	\$0.20

Source of knowledge economy GSP: Nous analysis using knowledge economy weights based on ANZSIC and ANZSCO, applied to chain volume measures of ABS state accounts 5220.0. Note that GDP represents the industry value add for industries, as does not include product from Other Dwellings, taxes less subsidies on products, or statistical discrepancy.

### Step three – forecast the increase in living standards attributable to AQ beyond 2020-21

The impact of AQ on productivity and GSP will last beyond the 2016-17 to 2020-21 period. It is assumed that the benefit to productivity will persist at 0.15 per cent until 2029-30, which is consistent with the innovation timeframes from the literature and input from stakeholder consultations (Table 12). The knowledge economy GSP is grown at the CAGR from the 2014-15 to 2020-21 period (2.44 per cent).

**Table 12 | Forecasted increase in living standards from 2021-22 till 2029-30**

BENEFITS	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
Knowledge economy GSP (\$, billions, real, chain volume index)	\$133	\$136	\$139	\$143	\$146	\$150	\$153	\$157	\$161
Productivity uplift (% MFP uplift attributable to AQ)	0.15%	0.15%	0.15%	0.15%	0.15%	0.15%	0.15%	0.15%	0.15%
Increase in living standards (\$, billions, real, chain volume index)	\$0.19	\$0.21	\$0.21	\$0.21	\$0.22	\$0.23	\$0.23	\$0.24	\$0.24

### Other notes on the approach

Some additional factors to consider related to this approach are below.

The NPV is highly sensitive to the productivity uplift figure. At a seven percent discount ratio, a 0.03 per cent per annum productivity uplift results in \$0.84 billion net benefit and a 1.6 BCR. If this productivity uplift figure is 0.01 per cent higher or lower, then the net benefit ranges from \$0.11 billion to \$1.57 billion and the BCR from 1.1 to 2.2. This high amount of sensitivity and large confidence interval is a result of the limitations in data and should be considered when using this figure. This productivity figure could be strengthened by more regular and detailed productivity data that was unavailable from QPC at the time this report was written.

### Approach 2: Knowledge economy outperformance

Another approach to quantify the macro-level benefit of AQ for Queenslanders is the increase in GSP of the knowledge economy relative to other states. This theoretically captures all outcomes of AQ. However, it is so broad that it also captures the impact of other government investments and underlying trends and

<sup>99</sup> Figures have been rounded to nearest billion dollars



therefore the full amount cannot be attributed to AQ. To determine an appropriate amount of the change that can be attributed to AQ, Nous investigated how much other Queensland Government investment that may impact the knowledge economy had been made alongside AQ. This excluded mining and focused on sectors targeted by AQ. The change in knowledge economy in Queensland was then compared to underlying growth of two percent per annum. This figure was determined based on the previous trajectory of the economy in Queensland prior to AQ.

This approach results in a NPV benefit of AQ of \$2.51 billion and a range of \$2.46 billion to \$2.59 billion.

### Step one – estimate the change in the Queensland knowledge economy attributable to AQ

The amount of this increase in knowledge economy attributable to AQ is a difficult assessment to make. Nous' approach has been to investigate the amount of other Queensland Government investment that has been made alongside AQ. There have been large increases in the funding of higher education, health, and other economic services during the period of AQ.<sup>100</sup> The investments included in this analysis do not include those which are considered routine (e.g. ongoing funding of schools and hospitals) or ongoing costs.<sup>101</sup> Once these other changes in government spending are accounted for, AQ represents 22.5 per cent of total additional expenditure in relevant areas which broadly relate to (and include) AQ.

### Step two – estimate the increase in GSP attributable to AQ up till 2020-21

The knowledge economy (KE) GSP growth above the benchmark rate of two percent was calculated. The two per cent real growth benchmark is a retrospective KPI that Nous created. This was required given that no benchmark rate of KE growth was established at the start or during AQ – it was a more vague KPI to grow the knowledge economy by an undetermined amount. Two per cent was inferred from underlying trend growth across other jurisdictions and prior to 2015. The amount of KE GSP above the benchmark rate was multiplied by this 22.5 per cent figure to apportion the amount of change in the GSP of the knowledge economy attributable to AQ (Table 13). Note that the figure is negative in 2019-20 due to the impact of COVID-19.

**Table 13 | Estimated increase in knowledge economy GSP from 2016-17 till 2020-21**

BENEFITS	2016-17	2017-18	2018-19	2019-20	2020-21
Knowledge economy GSP growth above benchmark 2% rate (\$, billions, real, chain volume index)	\$0.35	\$2.57	\$1.75	-\$0.75	\$0.75
Knowledge economy outperformance attributable to AQ (%)	22.5%	22.5%	22.5%	22.5%	22.5%
GSP benefit attributable to AQ (\$, billions, real)	\$0.08	\$0.58	\$0.39	-\$0.17	\$0.17

### Step three – forecast the increase in GSP attributable to AQ beyond 2020-21

The impact of AQ on the knowledge economy GSP will likely continue well beyond 2020-21, noting there are some funds committed but not yet spent, and past investments that will take time to bear fruit. So, similar to the analysis on productivity in Approach 1, the improvements in the knowledge economy GSP were assumed to persist at the 2021-22 until 2029-30 (Table 14), with the discount rate compounding at 7 per cent ensuring that less weight is given to the later years, in NPV terms. This takes into account typical

<sup>100</sup> Source of government spending figures is the Report on State Finances for the various periods (2015-16 to 2020-21). Specifically, the General Government Sector – Expenses by Function tables.

<sup>101</sup> Over this period there have likely been increases in Commonwealth funding that may have influenced the performance of the knowledge economy in Queensland, however those investments are out of scope for this evaluation.

innovation or intellectual property timeframes and benefit periods, which are shorter than for physical government investments like roads and or hospitals, which have a longer lifespan.

**Table 14 | Forecast increase in knowledge economy GSP from 2021-22 till 2029-30**

BENEFITS	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
Knowledge economy GSP growth above benchmark 2% rate (\$, billions, real, chain volume index)	\$0.75	\$0.75	\$0.75	\$0.75	\$0.75	\$0.75	\$0.75	\$0.75	\$0.75
Knowledge economy outperformance attributable to AQ (%)	22.5%	22.5%	22.5%	22.5%	22.5%	22.5%	22.5%	22.5%	22.5%
GSP benefit attributable to AQ (\$, billions, real)	\$0.17	\$0.17	\$0.17	\$0.17	\$0.17	\$0.17	\$0.17	\$0.17	\$0.17

### Other notes on the approach

Some additional factors to consider, related to this approach, are that the resulting benefits are highly sensitive to two measures: the outperformance attributable to AQ and the assumed data to which benefits continue to accrue.

### Approach 3: Business revenue outperformance

The third approach made use of the survey data collected by Nous to calculate the business revenue outperformance of AQ recipients and participants, compared with those SMEs that did not engage in AQ. This approach results in a NPV benefit of AQ of \$3.00 billion and a range of \$2.98 billion to \$3.03 billion.

### Step one – estimate the incremental revenue attributable to AQ

Analysis of survey data revealed that the median revenue growth from 2014-15 to 2020-21 for those businesses who participated in AQ was 2.05 times higher than those who did not participate (Table 15).<sup>102</sup> This figure was used as a ratio on the benchmark five per cent annual growth figure expected by SMEs. This benchmark market growth figure was calculated on the basis of ANSZIC division using ABS data. A continuous distribution is estimated from binned (histogram) data by fitting a log normal distribution to the ABS data series 8165.0 'Count of Australian Businesses, including Entries and Exits'. This approximated distribution is then used to estimate the average revenue in a given financial year for each ANZSIC division. That is, in the absence of AQ, SMEs in Queensland are estimated to grow at five per cent per annum.

Together these figures were used to calculate the out-performance of revenue attributable to businesses that were AQ recipients or participants. Additional revenue was then converted into value added, using ABS data for the Professional and Technical Services sector (this sector was chosen given its prominence in AQ grant recipients).<sup>103</sup> It was assumed that revenue growth would grow evenly up until 2021-22. The average revenue of AQ participants was taken from the survey data which suggests an average revenue pool in 2014-15 of \$795,000. The number of businesses included as recipient companies is 6,233 as taken from DTIS program data.

<sup>102</sup> Survey data was cleaned to remove extreme outliers and apparent data-entry errors.

<sup>103</sup> <https://www.abs.gov.au/statistics/economy/national-accounts/australian-national-accounts-input-output-tables/2018-19>

**Table 15 | Estimated increase in value added to Queensland attributable to AQ from 2016-17 to 2020-21**

BENEFITS	2016-17	2017-18	2018-19	2019-20	2020-21
Additional revenue from recipient companies (\$, billions)	\$0.05	\$0.10	\$0.19	\$0.39	\$0.78
Value added per \$ of revenue	0.5	0.5	0.5	0.5	0.5
Value added from revenue (\$, billions)	\$0.02	\$0.05	\$0.10	\$0.19	\$0.39

### Step two – forecast the impact of AQ beyond 2020-21

It was assumed that the increase in value added would start to reduce several years after the initial grant. So, the benefits are assumed to peak in 2021-22 to 2022-23 and then decay by 50 per cent a year until 2029-30. This amount of decay is broadly in line with other grant-based innovation programs, where the out-performance attributable to a one-off grant decays over time.

**Table 16 | Forecasted increase in valued added to Queensland attributable to AQ from 2021-22 till 2029-30**

BENEFITS	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30
Additional revenue from recipient companies (\$, billions)	\$1.56	\$1.56	\$0.78	\$0.39	\$0.19	\$0.10	\$0.05	\$0.02	\$0.01
Value added per \$ of revenue	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Value added from revenue (\$, billions)	\$0.78	\$0.78	\$0.39	\$0.19	\$0.10	\$0.05	\$0.02	\$0.01	\$0.01

### Other notes on the approach





Some additional factors to consider related to this approach are below.









The confidence interval around the 2.05 ratio is large and the raw figures show a large degree of heteroskedasticity (variability of random disturbance is different across the series). Despite the survey having over 700 responses, it is unlikely that this data is a perfect sample of the recipients and non-participants of AQ. For one instance, very few non-participants filled out the survey question regarding their revenue (thus, Nous having to rely on ABS data to estimate a growth rate of non-participant businesses).

## E.2 Overview of Queensland performance on key metrics






The performance of key metrics in Queensland is summarised in Table 17 below. The metrics are pulled from the AQ evaluation framework. Metrics have been removed where no recent data has been available, the source has been discontinued, or analysis has not been conducted due to change in focus.

Table 17 | Overview of Queensland performance on key metrics

Objective	Indicator	Source(s)	Baseline – 2016	Latest performance	Trend
<b>Strategy: Supporting Culture (SC)</b>					
SC2 – Increase entrepreneurialism	Value of new and follow-up investment of investee companies	ABS 5678.0 – Venture Capital and Later Stage Private Equity Australia	\$286 million in 2015-16 (18.5% of national total)	\$188 million in 2018-19 (12.9% of national total)	
	Business entry and exit rates	ABS 8165.0, Counts of Australian Businesses including Entries and Exits	Survival rate 60.2%, national is 62.1% Entry rate 14.6%, national is 14.6% Exit rate 12.7%, national is 12.3%	2018-19: Survival rate is 63.9%, national is 64.9% Entry rate is 15.1%, national is 15.7% Exit rate is 13.2%, national is 13.0% 2020-21: Survival rate is 69.7%, national is 70.4% Entry rate 15.6%, national is 15.8% (2020-21) Exit rate is 12.0, national is 12.0	
	Count of co-working spaces, startup incubators and accelerators	The Fetch – Startup Incubators and accelerators in Australia	Counts of innovation hubs and precincts: 23 in 2016 Count of startup incubators and accelerators: 7	Counts of innovation hubs and precincts: 28 in 2021 Count of startup incubators and accelerators: 7	
<b>Strategy: Building Capacity (BC)</b>					
BC1 – Increase innovation capability	Gross expenditure on R&D as a share of GSP including business expenditure on R&D as well as higher education	ABS 8104.0 – Research and Experimental Development, Businesses	BERD intensity (BERD/GSP) 0.57% [0.62% in eval framework] in 2015-16 BERD spend was \$1,955,628,000 in 2015-16	BERD intensity (BERD/GSP) 0.61% in 2019-20 BERD spend was \$2,235,201,000 in 2019-20	

Objective	Indicator	Source(s)	Baseline – 2016	Latest performance	Trend
		ABS 8111.0, Research and Experimental Development, Higher Education Organisations	HERD intensity (HERD/GSP) 0.5% in 2013-14 HERD spend was \$1,667,538,000 in 2013-14	HERD intensity (HERD/GSP) 0.55% in 2017-18 HERD spend was \$1,999,861,000 in 2017-18	
		ABS 8109.0, Research and Experimental Development, Government and Private Non-Profit Organisations	GOVERD intensity (GOVERD/GSP) 0.16% [0.1% in eval framework] in 2014-15 GOVERD spend was \$520,272,000 in 2014-15	GOVERD intensity (GOVERD/GSP) 0.17% in 2018-19 Total GOVERD (state and federal) spend was \$616,380,000 in 2018-19	
	Scholarly output per 1000 population	Elsevier SciVal	4.33 in 2016 <sup>104</sup>	4.68 in 2020	
	Share of scholarly output in top 10% most cited publications	Elsevier SciVal	17.8% in 2016	17.5% in 2020	
BC2 – Develop, attract and retain talent including STEM	Percentages of Year 6 students attaining the proficient standard	NAP Sample Assessment Science Literacy Public report	54% in 2015	64% in 2018	
	Proportion of high performing students in scientific literacy	PISA	10% in 2014-15	9% in 2017-18	
<b>Strategy: Fostering Collaboration (FC)</b>					
FC1 – Build sustainable partnerships to deliver outcomes	Share (%) of Queensland scholarly outputs with international co-authorship	Health of Queensland Science and Innovation (Office of the Queensland Chief Scientist, 2016)	52.2% in 2017 48.5% in 2015	57.5% in 2020	
	Share (%) of Queensland scholarly	Elsevier SciVal	3% in 2016	3.2% in 2020	

<sup>104</sup> AQ Evaluation framework had value of 3.83 in 2017, although this could not be replicated.

Objective	Indicator	Source(s)	Baseline – 2016	Latest performance	Trend
	outputs with academic-corporate collaboration				
FC2 – Increase international networks	Percentage of R&D financed abroad for Higher Education Expenditure on R&D (HERD)	ABS 8111.0 – Research and Experimental Development, Higher Education Organisations, Australia	\$27.1M in 2013-4	\$29.7m in 2017-18	
<b>Strategy: Increase Investment (II)</b>					
II1 – Grow pipeline of investible products and services	More business investment in R&D	ABS 8104.0, Research and Experimental Development, Businesses	BERD intensity (BERD/GSP) 0.58% in 2015-16	BERD intensity (BERD/GSP) 0.62% in 2019-20	
	Increased investment in research	ABS 8111.0 – Research and Experimental Development, Higher Education Organisations	HERD intensity (HERD/GSP) 0.51% in 2013-14	HERD intensity (HERD/GSP) 0.55% in 2014	
		ABS 8109.0 – Research and Experimental Development, Government and Private Non-Profit Organisations	GOVERD intensity (GOVERD/GSP) 0.16% in 2014-15	GOVERD intensity (GOVERD/GSP) 0.17% in 2018-19	
II2 – Build access to capital	Value of venture capital by investee company head offices as a share of GSP	ABS 5678.0 – Venture Capital and Later Stage Private Equity, Australia	\$1.2B in 2015-16 or 0.3% of GSP	\$1.5B in 2018-19 or 0.4% of GSP	
<b>Strategy: Scaling for jobs and growth (SJ)</b>					
SJ2 – Increase economic benefits from innovation (including jobs)	Jobs supported by AQ programs	AQ Program Data	9426 as at 30 September 2017	~27,000 as at 31 March 2021	
	Increase in jobs in knowledge economy in Queensland	BLADE	692,204 in 2014-15	764,963 in 2019-20	

# Appendix F Building Our Innovation Economy – AQ Strategy (2019)

The following is a summarised excerpt from the *Building Our Innovation Economy – AQ Strategy (2019)* document that is referenced within this report.

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## FUTURE PRIORITIES

Our priorities were identified through extensive stakeholder consultation, and will enable us to focus our efforts, solve our big challenges, ensure Queenslanders are prepared for the work of the future – and create jobs through innovation.

Our future priorities and key directions build on the review and evaluation of the AQ initiative to date, and research about innovation in Queensland. Our stakeholders have confirmed AQ is working and endorsed the new direction for our collective effort.

## KEY DIRECTIONS

The key directions for our priorities represent how we will work towards building our innovation economy in Queensland. They represent opportunities to achieve growth and create jobs through innovation. Each key direction will be delivered in partnership with our stakeholders and guide the next generation of action in Queensland.

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### Build on Queensland's Strengths

- Build world leading clusters
- Position Queensland as a global testbed for new technology
- Grow cleantech
- Prepare industry for change
- Focus our effort

### Back our regions to compete globally

- Unique competitive advantage
- Collaborating for global opportunities
- Ready for work and change
- Scale across industry silos
- Advance connectivity

### Scale up local solutions for new markets

- Build the pipeline
- Create global pathways
- Attract talent and capital for scaling
- Win-win for big and small
- Enhance small business capability
- Government walks the talk
- Inspire social innovation

### Invest in science and technology to create jobs

- Science for solutions
  - Missions that matter
  - Big data for better outcomes
  - Create a job
-

## IMMEDIATE ACTIONS

AQ has successfully created significant momentum towards building our innovation economy. We will focus our ongoing whole-of-government effort and future investment towards achieving our priorities. Our immediate actions start this work and represent several initiatives to extend the work of AQ.

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### Build on Queensland's Strengths

- Establish a field robotics industry cluster, focusing on mining, defence, agriculture and the environment
- Support a new AgTech and Logistics Hub in Toowoomba
- Develop a Skills Implementation Plan for Advanced Manufacturing

### Back our regions to compete globally

- Improve the quality and speed of internet services in regional Queensland through QCN Fibre
- Deliver a new connection with Townsville's Regional Data Centre through QCN Fibre
- Invest in a Rockhampton Technology and Innovation Centre to provide hands-on training and skills in robotics and automation technology
- Deliver the Regional Entrepreneurship Acceleration Program in Toowoomba, Gladstone and Mackay to encourage localised solutions and job creation
- Develop an SEQ Innovation Precincts Strategy that can be rolled out across regions

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### Scale up local solutions for new markets

- Partner with TAFE Queensland to support uptake of new high-tech skills training across Queensland
- Support the growth of social enterprises to deliver economic and social impact for Queensland
- Champion innovation in government and establish government as a lead customer for innovation
- Promote investment-ready Queensland startups and SMEs to international investors through Trade and Investment Queensland
- Provide a pipeline of innovation opportunities for Aboriginal and Torres Strait Islander peoples through the Deadly Innovation Strategy

### Invest in science and technology to create jobs

- Develop a Queensland Science Strategy to drive the impact and value of Queensland science
- Leverage Australian Government and industry funding through the \$25 million Research Infrastructure Co-investment Fund
- Target research funding towards priorities, including water and energy sustainability, healthcare, climate change and the Great Barrier Reef



# Appendix G Program Mapping

Five key strategies have been identified to implement the vision for AQ and guide the design and implementation of all AQ programs.

Each program within the AQ initiative has a number of expected outputs and outcomes, and contributes to one or more of the AQ strategies.

For the purpose of evaluation, 69 priority programs were mapped against key attributes, including AQ strategies. As per the Evaluation Framework, the programs selected as priority programs for evaluations are based on assessment of a range of attributes, including funding and value for money, and the profile or nature of the program.

Table 18 below contains a preliminary mapping of programs provided to Nous. Note that programs may fall under more than one strategy. This list is not exhaustive.

A list of unmapped programs is also provided.

**Table 18 | Programs per Strategy**

Supporting Culture	Building Capability	Fostering Collaboration	Increase Investment	Scaling for Jobs and Growth
The Precinct	Ignite Ideas Fund	Ignite Ideas Fund	Industry Attraction Fund	Industry Attraction Fund
Global schools through languages	Hydrogen	Integrated Care Innovation Fund	Business Development Fund	Business Development Fund
Office of the Queensland Chief Entrepreneur	Queensland Genomics Health Alliance	Connecting with Asia Strategy	Ignite Ideas Fund	Ignite Ideas Fund
Advancing Regional Innovation Program	Industry Research Fellowships	Hydrogen	Connecting with Asia Strategy	Connecting with Asia Strategy
Artificial Intelligence Hub	Biofutures	Queensland Genomics Health Alliance	Hydrogen	Hydrogen
Schools of the Future: A Strategy for STEM in Queensland State Schools	Research Fellowships	Biofutures	Queensland Genomics Health Alliance	Biofutures
Female Founders Program	The Precinct	The Precinct	Biofutures	The Precinct
Deadly Innovation	Small Business Digital Grants	JCU Ideas Lab	Innovation Partnerships Grants	Innovation Partnerships Grants

Supporting Culture	Building Capability	Fostering Collaboration	Increase Investment	Scaling for Jobs and Growth
Small Business Innovation Research	Global schools through languages	Office of the Queensland Chief Entrepreneur	JCU Ideas Lab	JCU Ideas Lab
Engaging Queenslanders in Science Strategy and Activities (prior TLI funding incl Citizen Science)	Defence	Advancing Regional Innovation Program (including Regional Startup Hubs Support Program)	Office of the Queensland Chief Entrepreneur	Small Business Digital Grants
Engaging Science Grants	Data61	Hot DesQ	Hot DesQ	Hot DesQ
AQ TAFE Queensland Pathways Scholarships	Artificial Intelligence Hub	Defence	Defence	Defence
Aboriginal and Torres Strait Islander Research Fellowships	Clem Jones Centre for Ageing Research	Data61	Data61	Artificial Intelligence Hub
States of Change	Small Business Regional & Industry Engagement	Artificial Intelligence Hub	Biomedical	Clem Jones Centre for Ageing Research
Aboriginal and Torres Strait Islander PhD Scholarships	Business Growth Fund (formerly Accelerate Small Business Grants)	Clem Jones Centre for Ageing Research	Knowledge Transfer Partnerships	Business Growth Fund (formerly Accelerate Small Business Grants)
Testing within Government	QEDDI Innovation Partnership	Small Business Regional & Industry Engagement	Aerospace	QEDDI Innovation Partnership
3 Day Startup	Industry Accelerators Program	QEDDI Innovation Partnership	Female Founders Program	Industry Accelerators Program
Entrepreneurs of Tomorrow	Biomedical	Biomedical	Technology Commercialisation Fund Project	Biomedical
GovLab	Knowledge Transfer Partnerships	Knowledge Transfer Partnerships	Deadly Innovation	Aerospace
Innovation Champions Network	Aerospace	Aerospace	Small Business Innovation Research	Female Founders Program

Supporting Culture	Building Capability	Fostering Collaboration	Increase Investment	Scaling for Jobs and Growth
Innovation Festivals	Small Business Entrepreneur Grants	IATC Siemens Healthcare partnership	IndustryTech Fund	IATC Siemens Healthcare partnership
	Schools of the Future: A Strategy for STEM in Queensland State Schools	Technology Commercialisation Fund Project	Mentoring for Growth Program	Deadly Innovation Program
	IATC Siemens Healthcare partnership	Deadly Innovation	Mining equipment, technology and services (METS)	Small Business Innovation Research
	Technology Commercialisation Fund Project	Growing Queensland's Companies	Innovation Festivals	Growing Queensland's Companies
	Deadly Innovation	Johnson and Johnson Partnership		IndustryTech Fund
	Advancing Small Business Queensland Strategy	Mentoring for Growth Program		Johnson and Johnson Partnership
	Small Business Innovation Research	Mining equipment, technology and services (METS)		Mentoring for Growth Program
	Women's Academic Fund	MIT Bootcamp		Mining equipment, technology and services (METS)
	Johnson and Johnson Partnership	Fraunhofer Institute Partnership		Fraunhofer Institute Partnership
	Engaging Queenslanders in Science Strategy and Activities (prior TLI funding incl Citizen Science)	Life Sciences Queensland - Catalyst		Startup Onramp Regional Program
	Mentoring for Growth Program	States of Change		Life Sciences Queensland - Catalyst
	Queensland Startup Events and Activities Fund	Startup Catalyst		Testing within Government

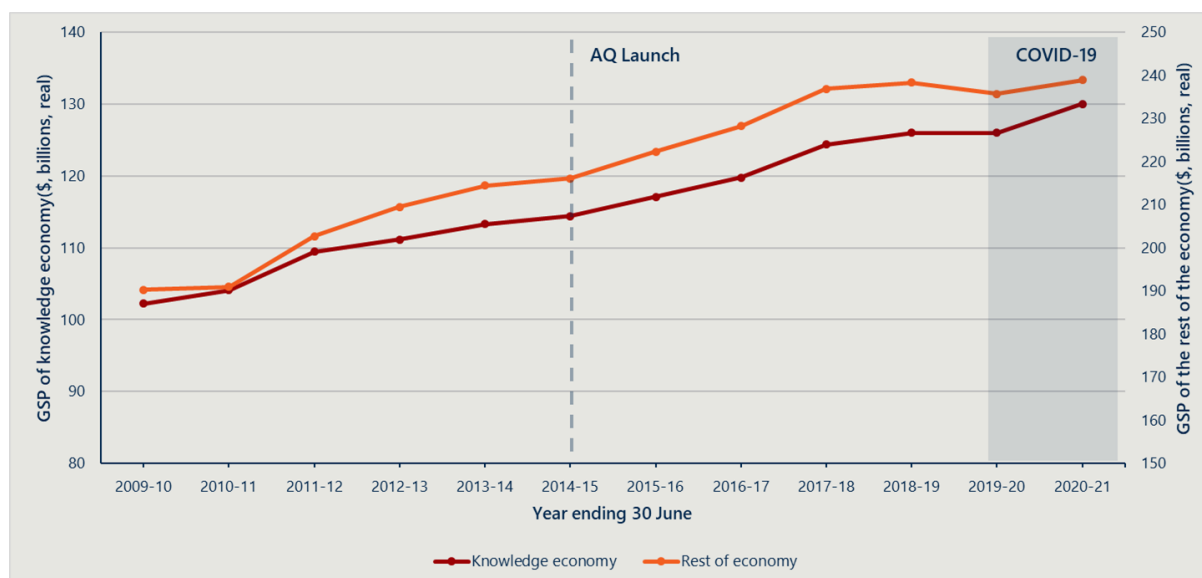
Supporting Culture	Building Capability	Fostering Collaboration	Increase Investment	Scaling for Jobs and Growth
	Mining equipment, technology and services (METS)	Young Starters' Competition		
	Women's Research Assistance Program	International Delegations		
	AQ TAFE Queensland Pathways Scholarships	GovLab		
	PhD Scholarships	Innovation Champions Network		
	Fraunhofer Institute Partnership	Innovation Festivals		
	Startup Onramp Regional Program	Sparkplug		
	Young Starters' Fund			
	Life Sciences Queensland - Catalyst			
	Review of STEM education in Queensland state schools			
	Aboriginal and Torres Strait Islander Research Fellowships			
	States of Change			
	Aboriginal and Torres Strait Islander PhD Scholarships			
	Testing within Government			
	GovLab			
	Innovation Champions Network			
	Sparkplug			

**Table 19 | AQ funded programs for which mapping to AQ Strategies was not provided**

Unmapped Programs		
Accelerate Small Business Grants	Innovate Queensland	Queensland-Cooper Hewitt Fellowships Program
Agtech and Logistics Hub	Innovation Precincts and Places	Queensland-Smithsonian Fellowships Program
AustCyber – Establishment of a Queensland Node	Language Improvement Grants	Ramen Life
Australian Biomass for Bio-energy assessment	Life Sciences Queensland	Reckon Business Hubs
BDO Business of Entrepreneurship	Mackay Clinical Trials	Regional Business Angels Support Program
Biofutures Commercialisation Program	Medical Research Commercialisation Fund	Regional Network Fund
Bionics	Mental Health Services for Founders	Regional Startup Hubs Support Program
Cherbourg AI	MIT Regional Entrepreneurship Acceleration Program	Rockhampton Technology and Innovation Centre
Chinese Ministry of Science and Technology – MOST	Myriad	SoftBank
Citizen Science Grants	Open Innovation Challenge	Sport Science Challenge
Commercialisation Partnerships Program	Orange Sky - Campfire	Startup Gladstone – EarlyPrenuer Programme
Community language schools	Platform Technology Program	STEM.I.AM Program
Create Queensland	Priority Industries Program (MOU DSD)	Stryker Initiative
Deadly Data	Professional development for teachers and principals	Sunramp Accelerator Program
Defence Science Alliance	QCN Fibre connection to North Queensland Regional Data Centre	Therabubble
Dubai South	QCN Fibre Regional Pilot Program	Travello
Founders Fellowships	QiHub	UQ - COVID-19 Vaccine
Global CEO Challenge	QODE	WaterStart
Ideation Hub	Queensland Connects	World Science Festival
Indigenous Native Food Project	Queensland Government Research Infrastructure Co-Investment Fund	Yarrabah Business Accelerator Incubation Hub
Industry Technology Fund	Queensland-Chinese Academy of Sciences (QCAS) Collaborative Science Fund	Year of Indigenous Tourism

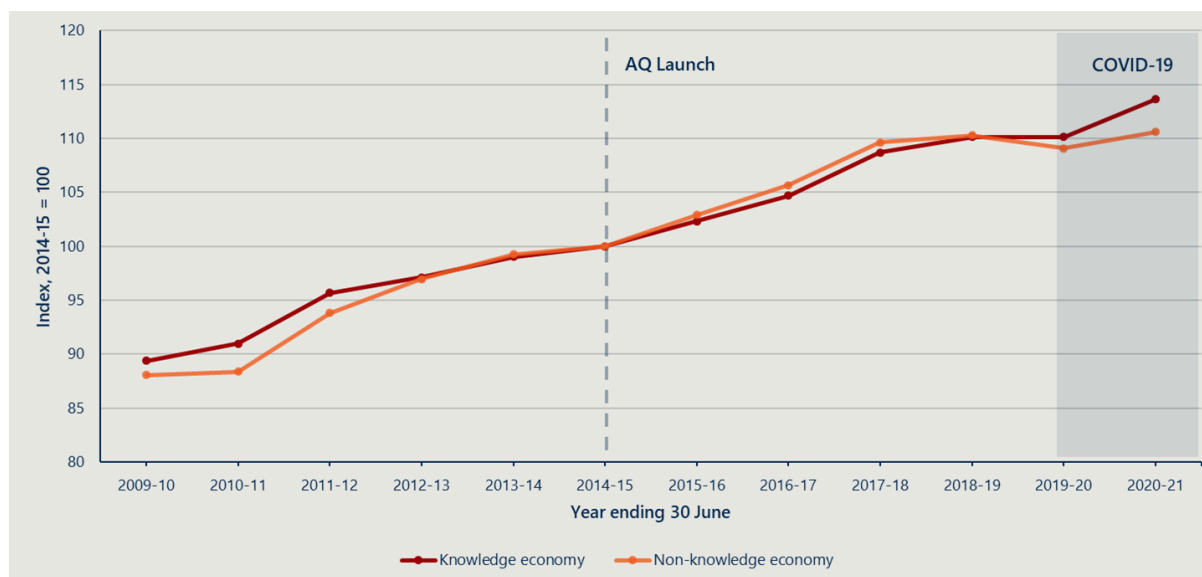
## Appendix H Other graphs

Figure 5353 | Real GSP of the knowledge economy and non-knowledge economy in Queensland (left axis = knowledge economy, right axis = rest of the economy)



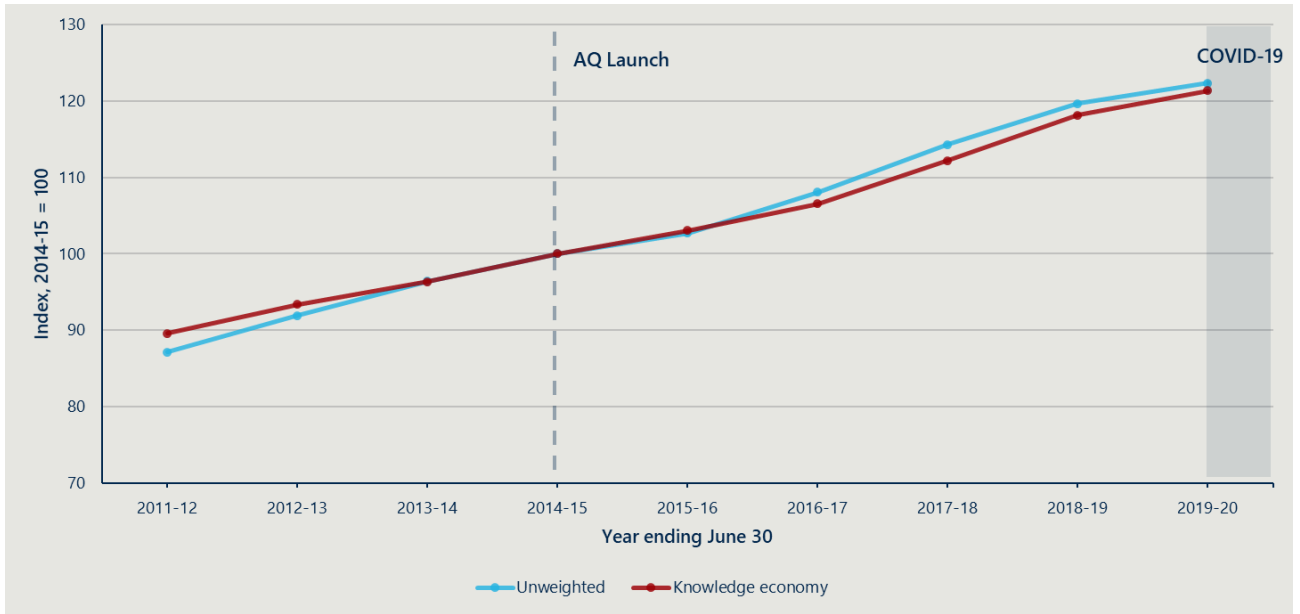
Source: Nous analysis using knowledge economy weights based on ANZSIC and ANZSCO, applied to chain volume measures of ABS state accounts 5220.0. Note that GDP represents the industry value add for industries, as does not include product from Other Dwellings, taxes less subsidies on products, or statistical discrepancy.

Figure 5454 | Real GSP of the knowledge economy and non-knowledge economy in Queensland comparison (index, 2014-15 = 100)



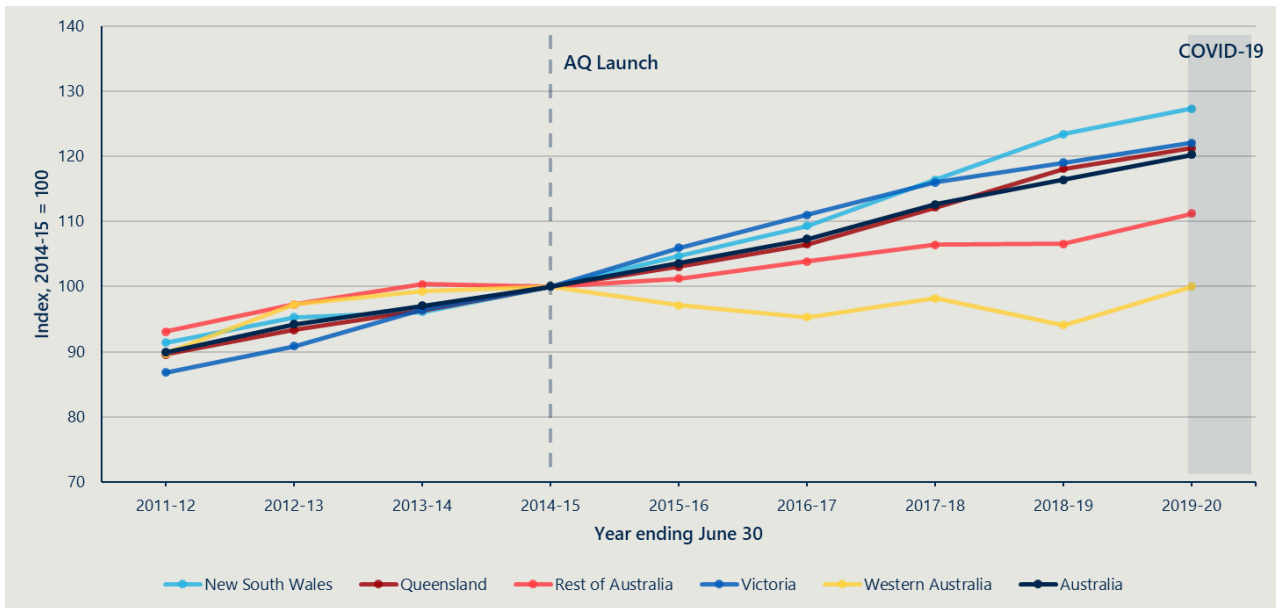
Source: Nous analysis using knowledge economy weights based on ANZSIC and ANZSCO, applied to chain volume measures of ABS state accounts 5220.0. Note that GDP represents the industry value add for industries, as does not include product from Other Dwellings, taxes less subsidies on products, or statistical discrepancy.

Figure 5555 | Wages of the knowledge economy and non-knowledge economy in Queensland comparison (index, 2014-15 = 100)



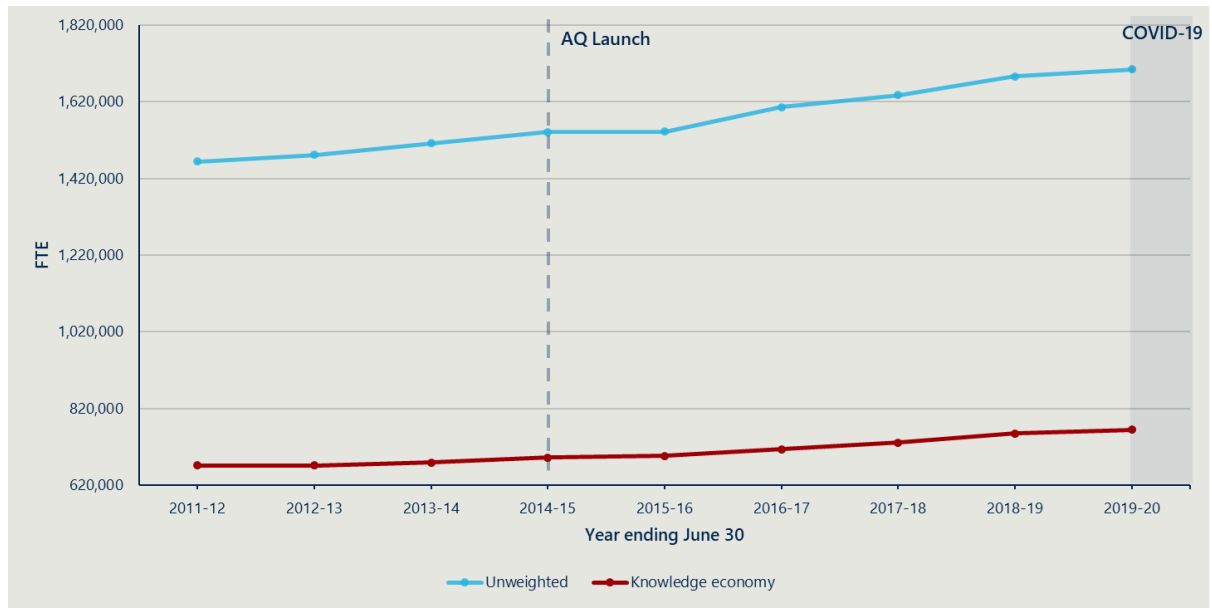
Source: Nous analysis using BLADE extracts provided by Department of Tourism, Innovation and Sport

Figure 56 56| Wages of the knowledge economy comparison (index, 2014-15 = 100)



Source: Nous analysis using BLADE extracts provided by Department of Tourism, Innovation and Sport

Figure 5757 | Knowledge Economy and Unweighted FTE in Queensland



Source: Nous analysis using BLADE extracts provided by Department of Tourism, Innovation and Sport. Figures were calculated by applying knowledge industry weightings to FTE counts of businesses.



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## ABOUT NOUS

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**Nous Group** is an international management consultancy operating across Australia and New Zealand, the UK, Ireland and Canada. For over 20 years we have been partnering with leaders to shape world-class businesses, effective governments and empowered communities.



bold  
performance & influence  
engaging

Australia | New Zealand | UK | Ireland | Canada

450

PEOPLE

50

PRINCIPALS

5

COUNTRIES

**+82.5**

**2020 NET PROMOTER SCORE**  
– global consulting average: **+70.1**