Australian Government

Australian Research Council

Evaluation of the Industrial Transformation Research Program process and priorities

Final report

Australian Research Council
Program Evaluation Section

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Contents

Abbreviations and glossary

ARC	Australian Research Council
CEO	Chief Executive Officer
CI	Chief Investigator
CRC	Cooperative Research Centres
CRC-P	Cooperative Research Centres Projects
DIIS	Department of Industry, Innovation and Science
HDR	Higher degree by research
IGC / Growth Centres	Industry Growth Centres
ITRH / Research Hubs	Industrial Transformation Research Hubs
ITRP	Industrial Transformation Research Program
ITTC / Training Centres	Industrial Transformation Training Centres
NISA	National Innovation and Science Agenda
PDR	Postdoctoral researcher
PI	Partner Investigator
Return rate	The amount of ARC funding awarded as a percentage of funding requested in successful applications
RMS	Research Management System
Success rate	The number of funded projects as a percentage of applications submitted

Structure of this report

This report on the evaluation of the Industrial Transformation Research Program (ITRP) process and priorities is structured as follows:

- The main body provides information on the evaluation's background, purpose, terms of reference, evaluation questions and methodology. It also presents the evaluation's key findings and recommendations, informed by the analysis in Appendices 1 and 2.
- Appendix 1 presents analysis of ARC documents, data and information on the ITRP undertaken by the ARC Program Evaluation section.
- Appendix 2 presents analysis of ITRP stakeholder surveys and interviews undertaken by ARTD Consultants Pty Ltd.

Executive summary

The Australian Research Council (ARC) Industrial Transformation Research Program (ITRP) supports collaboration between university researchers and industry to find solutions to industry problems and transform Australian industries. The ITRP consists of Industrial Transformation Research Hubs—supporting collaborative research that benefits industry partners—and Industrial Transformation Training Centres—supporting industry focused training for higher degree by research (HDR) students and postdoctoral researchers (PDR). It supports research in key growth areas (Industrial Transformation Priorities), which are consistent with the Government's Industry Growth Centres initiative.

The ARC undertook an evaluation to assess the effectiveness and efficiency of ITRP processes and priorities in supporting industry focused research and research training, and its role and contribution among other relevant Australian Government programs. The evaluation focused primarily on the design, implementation and administration of the ITRP. It did not focus on the outcomes and benefits of funded research or research training. The evaluation drew upon ARC policy and program documents, data and information, as well as independent stakeholder survey and interview research conducted by ARTD Consultants Pty Ltd.

The evaluation found that, in general, ITRP stakeholders consider the scheme to be effective in supporting high quality, industry focused research collaboration and integrated research training. The ITRP has attracted the participation of increasing numbers of partner organisations over time, although different stakeholder groups had different perceptions of the nature of partner organisation involvement in various ITRP processes.

Stakeholders predominantly felt that the ITRP supports research training that is of high academic quality and applicable to industry skills. However, the evaluation found that ARC data collection processes do not currently support accurate reporting and monitoring of HDR and PDR training delivery under the ITRP.

Although stakeholders saw benefits in the scheme's interaction with Industry Growth Centres, some expressed uncertainty about the Growth Centres' role. Additionally, while most felt that the Industrial Transformation Priorities effectively focus research in key areas, some stakeholders perceived them to have gaps or be narrow. More broadly, the ITRP was generally considered to be unique, even though a majority of stakeholders perceived overlaps with other Australian Government programs.

Most stakeholders considered the ITRP process overall to be effective and efficient. Challenges they identified included negotiating and finalising partnership arrangements, application size and timeframes, and domestic student recruitment.

The evaluation makes four recommendations to the ARC to improve the effectiveness and efficiency of its implementation of the ITRP:

1. Consider revisions to improve the flexibility and clarity of the ITRP process with respect to the Industrial Transformation Priorities and the role of Industry Growth Centres
2. Collect additional data on HDR students and PDRs through Training Centre and Research Hub final reports
3. Consider using the metrics provided in this evaluation's analysis as benchmarks to monitor performance of the ITRP and inform improvements
4. Address issues highlighted in this evaluation in ongoing ITRP stakeholder engagement, advice and outreach.

Background

The Industrial Transformation Research Program

The Industrial Transformation Research Program (ITRP)[1] supports collaboration between university researchers and industry to find solutions to industry problems and develop new products, processes and services to transform Australian industries. The ITRP consists of Industrial Transformation Research Hubs (ITRH, or Research Hubs)—providing funding for collaborative research that benefits industry partners—and Industrial Transformation Training Centres (ITTC, or Training Centres)—supporting partnerships to provide innovative higher degree by research and postdoctoral training for end-user focused research in industries vital to Australia's future. ITRP funding is provided for research in key growth areas (Industrial Transformation Priorities), which are consistent with the Government's Industry Growth Centres initiative.[2]

The Research Hub objectives are to:

- encourage collaborative R&D projects between universities and organisations outside the Australian higher education sector that will engage in cutting-edge research on new technologies to create economic, commercial and social transformation;
- leverage national and international investment in targeted industry sectors, including from industry and other research end-users; and
- drive growth, productivity and competitiveness within the Industrial Transformation Priorities.

The Training Centre objectives are to:

- support opportunities for HDR candidates and postdoctoral researchers to pursue industrial training;
- drive growth, productivity and competitiveness by linking to the relevant sectors;
- enhance competitive research collaboration between universities and organisations outside the Australian higher education sector; and
- strengthen the capabilities of industry and research end-users in identified Industrial Transformation Priority areas.[3]

The Industrial Transformation Training Priorities are subject to review from round to round, but have been aligned with the priority areas for the Industry Growth Centres initiative since its introduction in 2015. The current Industrial Transformation Priorities are:

- Advanced Manufacturing
- Cyber Security
- Food and Agribusiness
- Medical Technologies and Pharmaceuticals
- Mining Equipment, Technology and Services
- Oil, Gas and Energy Resources.

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[1] www.arc.gov.au > Grants > Linkage Program> Industrial Transformation Research Program.
[2] www.industry.gov.au > Strategies for the future> Industry Growth Centres.
[3] *Grant Guidelines for the Industrial Transformation Research Program (2018) for funding commencing in 2019*, available at www.grants.gov.au > Forecast Opportunity View - ITRP2019. Note: analysis by ARTD Consultants (Appendix 2) addressed the objectives in ITRH and ITTC *Funding Rules for funding commencing in 2018*, available at www.arc.gov.au > Grants > Grant application > Funding Rules/Grant Guidelines > Linkage Program Funding Rules/Grant Guidelines.

Evaluation overview

Authorisation and management

This evaluation was authorised and undertaken in accordance with the ARC Evaluation Strategy and Strategic Evaluation Plan.[4]

The evaluation was managed and conducted by the ARC Program Evaluation Section, which sits within the Corporate Services Branch and is independent from policy and program functions within the ARC organisational structure.

The Program Evaluation Section consulted with relevant ARC line areas to identify the priorities and issues addressed in the evaluation, seek advice on policy and program matters, and access policy and program data, documents and information.

The Program Evaluation Section engaged ARTD Consultants to conduct independent survey and interview research with external and internal stakeholders as an input to the evaluation. ARTD Consultants' stakeholder engagement services were procured under the whole-of-government Research, Evaluation and Data panel arrangement, administered by the Department of Social Services.

Reasons for the evaluation

Since its introduction in 2012, the ITRP has not been formally evaluated. This evaluation was therefore undertaken to assess the ITRP's effectiveness in supporting research collaboration, translation and commercialisation—particularly to address industry issues—and its alignment with government innovation priorities. In that context, there is a need to assess the efficiency and effectiveness of the administration of the ITRP in supporting potentially complex collaborative research and research training arrangements. It is also important to assess the ITRP's role and contribution to supporting industry focused research along with other programs such as Industry Growth Centres, Cooperative Research Centres (CRC), Cooperative Research Centres Projects (CRC-P) and the Global Innovation Linkages Program.

Purpose and scope

The purpose of the evaluation was to provide evidence, and asses the effectiveness and efficiency of ITRP processes in meeting their objectives and supporting government priorities. The evaluation focused primarily on the design, implementation and administration of the ITRP. The evaluation's scope included all ITRP activity since its introduction in 2012.

The evaluation did not focus on the outcomes of funded research or assess the effectiveness of the ITRP in supporting research that solves challenging industry issues, and driving growth, productivity and competitiveness. As the activities of the majority of funded Research Hubs and Training Centres are still underway, it was too early to assess the outcomes arising from completed research and research training under the ITRP.

[4] www.arc.gov.au > Policies & Strategies > Strategy > Evaluation > ARC Evaluation Strategy.

The primary intended use of the evaluation is to inform whether any changes or improvements should be made to the implementation of ITRP processes and priorities by the ARC. The evaluation's findings may also be useful for informing the university research sector (including researchers and research trainees), industry and other ITRP partner organisations about issues relevant to developing collaboration and applications under the ITRP, as well as establishing Research Hubs and Training Centres.

Terms of reference

The evaluation's terms of reference were to:

1. Assess the effectiveness and efficiency of ITRP scheme design, processes and administration in meeting the objectives of supporting industry focused collaborative research (through ITRH) and higher degree by research and postdoctoral training (through ITTC), as well as addressing issues involved in the management of potentially complex collaborative projects.
2. Assess the role and contribution of the ITRP in the broader context of Australian Government programs that support industry focused research, including its potential complementarity and overlaps with Industry Growth Centres, CRC, CRC-P and the Global Innovation Linkages Program.

Evaluation questions

To address the terms of reference, the evaluation sought to answer the following questions:

1. Does the ITRP effectively support industry focused research collaboration?
    a. How many partner organisations have been involved?
    b. What types of partner organisations have been involved?
    c. How many collaborations were new and how many already existed?
    d. How much and what kind of contributions (cash/in kind) have partner organisations provided? What is the impact of different types of contributions on successful collaboration?
    e. How have partner organisations been involved in the development of ITRP applications and the design of programs and projects? Is expertise related to research translation and commercialisation typically included in program and project design?
2. Does the ITRP effectively support industry focused research training?
    a. How many higher degree by research (HDR) students and postdoctoral researchers (PDR) have been involved?
    b. What roles have HDR students and PDRs played in ITRP projects? What types of industry placements have they had?
    c. Why do HDR students and PDRs choose to be involved in the ITRP (as opposed to other opportunities for industry experience)?
    d. How have partner organisations been involved in the development and design of ITRP placements?
3. How effective is engagement with Industry Growth Centres as part of ITRP processes?
    a. How useful and important is the advice provided by Growth Centres to universities, researchers and partner organisations?
    b. Does it support opportunities for collaboration that may not otherwise occur, or that add to existing collaboration? What do these opportunities add?

c. Does it support innovative research and the development of well targeted, industry focused projects?
d. Does engagement with Growth Centres extend beyond the proposal stage? If so, in what form?

4. How well does the ITRP fit with other Australian Government programs that support industry focused research and innovation, including Growth Centres, CRC, CRC-P and the Global Innovation Linkages Program?
    a. Why do administering organisations and their partners seek support under the ITRP rather than other industry focused research schemes? Do they submit applications to multiple schemes?
    b. Do the Industrial Transformation Priorities (which match the areas of focus for the Growth Centres) effectively focus applications on key industry priority areas?
    c. Are there potential overlaps or inconsistencies between the ITRP and other industry focused research schemes?
5. How effective and efficient is the implementation of the ITRP process, and the associated advice provided by the ARC to ITRP applicants and other stakeholders, including in relation to:
    a. Establishing collaboration (for example, through project development, negotiation, and planning)
    b. Application and assessment processes
    c. Project implementation issues (for example, establishment, contracts, recruitment, intellectual property and commercialisation arrangements)?

Methodology

The evaluation questions were addressed through analysis of the following sources of data and information:

- ARC policy and program documents, and quantitative and qualitative ARC program management data and information
- qualitative and quantitative stakeholder feedback collected through surveys and interviews conducted by ARTD Consultants.

ARC policy and program documents, data and information

A range of ARC policy and program information and materials were used to inform the development of the evaluation and the analysis presented in this report. These included publicly available sources such as the ARC ITRP webpage,[5] grant guidelines and funding rules,[6] as well as internal policy and program management documents such as scheme timelines, stakeholder engagement materials (such as presentations), ITRH and ITTC progress and final reports, reports from ad hoc ITRH and ITTC reviews conducted by the ARC, and previous stakeholder feedback.

Program management data on the ITRP were sourced from the ARC's Research Management System (RMS), and included application, outcome, funding, partner organisation and other data. Advice on interpretation, complexities and caveats associated with the data was provided by relevant policy and program owners and administrators within the ARC.

[5] www.arc.gov.au > Grants > Linkage Program > Industrial Transformation Research Program.
[6] See www.arc.gov.au > Grants > Grant application > Funding Rules/Grant Guidelines > Linkage Program Funding Rules/Grant Guidelines; and www.grants.gov.au > Forecast Opportunity View - ITRP2019.

Detail on the analysis of ARC documents, data and information on the ITRP is provided in Appendix 1.

Stakeholder surveys and interviews

The stakeholder engagement undertaken by ARTD Consultants included delivery of surveys and interviews, collection and analysis of quantitative and qualitative response data, and reporting to the ARC.

Surveys were tailored and delivered to the following ITRP stakeholder groups:

- research offices at universities involved with successful applications for ITRP funding
- Research Hub and Training Centre directors and managers involved with successful applications for ITRP funding
- Chief Investigators (CIs) involved with successful applications for ITRP funding
- Partner Investigators (PIs) involved with successful applications for ITRP funding
- higher degree by research (HDR) students and postdoctoral researchers (PDRs) who had undertaken research training within a Research Hub or Training Centre
- Industry Growth Centre representatives.

A total of 33 interviews were also held with members of the following ITRP stakeholder groups:

- university research office representatives (seven)
- Research Hub and Training Centre directors and managers (20 interviews representing ten Research Hubs and ten Training Centres)
- ARC representatives (two)
- Department of Industry, Innovation and Science (DIIS) representatives (two).

It is important to note that only research offices, directors, managers, CIs and PIs involved with successful ITRP applications were included in the surveys and interviews (although some of these stakeholders had also been involved in unsuccessful applications). This was largely due to the better availability of current contact details for successful stakeholders. This represents a limitation in the evaluation's methodology, as stakeholders who had not been involved in successful applications may have provided very different responses.

Contact details for all stakeholder groups were provided confidentially to ARTD Consultants by the ARC. ARTD Consultants de-identified all survey and interview responses and destroyed all stakeholders' contact details upon completion of the services.

Detail on the survey and interview methodology, analysis of the responses and the key findings identified by ARTD Consultants are provided in their final report to the ARC, in Appendix 2.

Key findings

These findings are drawn from analysis of ARC documents, data and information on the ITRP (Appendix 1) and stakeholder survey and interview research conducted by ARTD Consultants (Appendix 2).

ITRP objectives

1. In general, stakeholders agreed that the ITRP both fosters important research partnerships and supports research trainees to gain skills in industry priority areas.

ITRP support for industry focused research collaboration

2. Overall, university and partner organisation stakeholders felt that the ITRP effectively supports industry focused research collaboration.
    - Perceived strengths included providing industry with access to research expertise and providing researchers with advice on industry needs.
    - Stakeholders generally felt that the ITRP supports high quality, reliable partnerships.
3. The number of partner organisations involved in funded Research Hubs and Training Centres has increased over time, indicating that the ITRP's effectiveness in supporting collaboration may have improved as it has matured.
    - The average number of partner organisations has grown from 3.25 to 11 per Research Hub, and from 4.75 to 11.86 per Training Centre.
4. Consistent with the ITRP's focus on industry issues, 75 per cent of all partner organisations have been from industry and business. The ITTC has had a slightly more diverse mix of partner organisation types than the ITRH.
5. International partner organisations have accounted for 16.4 per cent of all partner organisations in both Research Hubs and Training Centres.
6. In line with the different requirements of the ITRH and ITTC:
    - combined cash and in kind contributions from partner organisations have amounted to 154 per cent of the total funding requested from the ARC in successful ITRH applications and 92 per cent in successful ITTC applications
    - ITTC partner organisations' average in kind contributions have been consistently higher in value than their cash contributions, while ITRH partner organisations' cash and in kind contributions have tended to be more even.
7. Stakeholders reported that collaboration under the ITRP has most commonly been initiated through existing relationships. They also indicated that new collaborations were more common in Training Centres than in Research Hubs.
8. Stakeholder groups had differing perceptions of the ways partner organisations were involved in the development of ITRP applications.
    - 85 per cent of university stakeholders and only 60 per cent of PIs reported that partners were consulted in the development of the entire Research Hub or Training Centre research program.
    - 71 per cent of university stakeholders and only 30 per cent of PIs reported that partners were involved in consulting with Industry Growth Centres.
9. Half of director, manager and CI participants reported partner organisations dropping out during the life of the Research Hub or Training Centre.

ITRP support for industry focused research training

10. Stakeholders predominantly felt that the ITRP performs well in supporting integrated research training that is of high academic quality and relevance, and is applicable to industry skills.
11. Current ARC data collection processes do not support accurate reporting on the total number of HDR students and PDRs involved over the life of each Research Hub and Training Centre.
    - Changes to ITRP reporting processes would support improved monitoring and evaluation of ITRP support for industry focused research training.
    - Further survey research with HDR students and PDRs in future may help the ARC to better understand employment and other outcomes for ITRP research trainees.
12. Many university and partner organisation stakeholders noted that recruitment of HDR students and PDRs was a challenge.
13. HDR students and PDRs expressed the view that more, higher quality research training opportunities through industry placements and skills development courses were required.
14. Stakeholder groups had differing perceptions of partner organisation involvement in the development of research training programs, with 85 per cent of university stakeholders and only 64 per cent of PIs reporting that partners were involved.

Engagement with Industry Growth Centres

15. The benefits of Growth Centre engagement that stakeholders cited most commonly were identifying and enabling partnerships, support in the application and program design process, and the provision of market advice.
16. PIs felt Growth Centres were more useful for identifying university partners than university stakeholders felt they were for identifying industry partners.
17. While most stakeholders found Growth Centres easy to reach and responsive, some reported difficulties in contacting and engaging with them.
18. Stakeholders expressed some uncertainty and a need for greater clarity about the Growth Centres' role in ITRP application and assessment processes.
    - The ARC has provided additional advice in the latest ITRP grant guidelines, but further stakeholder engagement on this issue may be valuable.
19. The majority of stakeholders reported that engagement with Growth Centres had extended beyond the Research Hub or Training Centre program development phase.
20. Growth Centre stakeholders felt that interaction between the ITRP and the Growth Centres supports both programs in achieving their objectives.

ITRP fit with other Australian Government programs

21. Stakeholders generally perceived the ITRP to be unique in its support for integrated collaborative research and research training, and the scale of research collaboration supported. They perceived it to effectively complement other Australian Government programs.
22. Stakeholders had mixed views on whether the ITRP overlaps with other Australian Government programs, with just over half (54 per cent) agreeing that to some extent it does. The research did not clearly identify the nature of the perceived overlaps or test whether they exist.

23. Stakeholders generally felt that the Industrial Transformation Priorities (which align with the Industry Growth Centre priority areas) effectively focus applications on key industry priority areas, although some perceived them to have gaps or to be narrow.
    - It may be possible to revise elements of the ITRP's design and guidelines to allow more flexibility in the Industrial Transformation Priorities and to clarify the Growth Centres' role in the process.

ARC implementation of the ITRP process

24. Overall, most stakeholders considered the ITRP process to be effective and efficient.
25. Stakeholders were mostly positive about the usefulness of the ARC's advice and information at various stages of the ITRP process. However, some sources (for example, grant guidelines and associated documents) were clearly seen as more useful than others (ARC feedback on progress and final reports).
26. As identified by stakeholders:
    - challenging aspects of the application process included negotiation of partnership, intellectual property and commercialisation arrangements, the timeframes for the application process and the size of applications
    - challenging aspects of the establishment process included domestic student recruitment, along with negotiating, finalising and managing partnership, intellectual property and commercialisation arrangements.

Recommendations

Recommendation 1: Industrial Transformation Priorities

The ARC should **consider revisions to improve the flexibility and clarity of the ITRP process with respect to the Industrial Transformation Priorities and the role of Industry Growth Centres**.

Such revisions should seek to address stakeholder perceptions that the Industrial Transformation Priorities are narrow (finding 23), that the Industry Growth Centres' role in the ITRP process is unclear (finding 18), and some reported difficulties in engagement with the Growth Centres (finding 17). They may include the following elements:

1. In the ITRP grant guidelines, retain the requirement for applications to address one or more of the Industrial Transformation Priorities.
2. Continue to include all Industry Growth Centre priority areas in the Industrial Transformation Priorities, but also consider the inclusion of additional priorities for each round—in consultation with appropriate stakeholders, including relevant ministers and DIIS.
3. Amend the ITRP guidelines to *require* applicants to engage with relevant industry experts (such as, but not exclusively, Growth Centres) to ensure the proposed research is targeted to support growth in the relevant Industrial Transformation Priority areas.
4. Amend the ITRH and ITTC assessment criteria to require applicants to describe the ways in which engagement with industry experts (such as, but not exclusively, Growth Centres) has ensured that the proposed research is targeted to support growth in the relevant Industrial Transformation Priority areas.

5. Ensure that industry expertise on ITRP Selection Advisory Committees covers any additional priority areas identified for each round.

The ARC should continue to work closely with DIIS and the Growth Centres in relation to their interaction with the ITRP and continue to emphasise the value of engagement with the Growth Centres in its ITRP advice and outreach activities.

Recommendation 2: Information on HDR students and PDRs

The ARC should **collect additional data on HDR students and PDRs through Training Centre and Research Hub final reports**.

To support improved monitoring and evaluation of ITRP support for industry focused research training, this should include data on the total number of HDR students and PDRs who participated over the life of the Training Centre or Research Hub, the nature of their involvement, whether they completed their training, and whether they were supported by ARC funding, partner organisation contributions, or other sources.

In addition, the ARC may wish to consider undertaking further survey research with HDR students and PDRs in future to better understand employment outcomes for ITRP research trainees (finding 11).

Recommendation 3: Data and monitoring

The ARC should **consider using the metrics provided in this evaluation's analysis as benchmarks to monitor performance of the ITRP and inform improvements**.

Useful metrics from existing ARC data collections may include:

- number of partner organisations involved in funded projects (finding 3)
- types of partner organisations involved in funded projects (finding 4)
- international partner organisations involved in funded projects (finding 5)
- value of partner organisation cash and in kind contributions (finding 6).

Recommendation 4: Engagement, advice and outreach

The ARC should **address issues highlighted in this evaluation in ongoing ITRP stakeholder engagement, advice and outreach**.

In particular, the evaluation's findings can help to inform the ARC's advice to stakeholders in particular areas, such as:

- finding the right partners, including the importance of managing expectations and the dimensions of collaboration involved under the ITRP (findings 8, 14)
- the views of HDR students and PDRs in relation to research training (finding 13)
- addressing key challenges in the ITRP application and establishment processes (findings 12 and 26).

In addition, there may be opportunities for the ARC to use regular and ongoing engagement mechanisms to seek further information and feedback from stakeholders on issues raised in this evaluation, such as:

- the initiation of collaboration under the ITRP (finding 7)

- issues in the retention of partner organisations (finding 9)
- the usefulness of ARC advice and information (including, for example, in relation to the role of Growth Centres in the process) (finding 18).

APPENDIX 1: Analysis of ARC data and information

This appendix provides analysis of ARC documents, data and information on ITRP processes and priorities. It addresses a number of particular issues raised in the evaluation questions, but does not comprehensively address all of the evaluation questions. It is intended to complement—and should be read in conjunction with—the survey and interview findings report by ARTD Consultants, in Appendix 2.

The analysis presented here includes application, outcome, funding, partner organisation and other data from all ITRP rounds from the commencement of the scheme in 2012 to the most recently completed round in 2018. The 2019 round was underway but had not been completed at the time of this report's preparation. Data from that round has therefore not been included, but the analysis does include reference to key program documents for that round as they are the most recent available.

The analysis involves data for both ITRP schemes (ITRH and ITTC), with ITRH rounds signified by an 'H' (for example, 2018 H) and ITTC rounds signified by a 'C' (for example, 2018 C). Further, two ITRH rounds were conducted for 2013, and are identified in the analysis as 2013 H1 and 2013 H2.

ITRP support for industry focused research collaboration

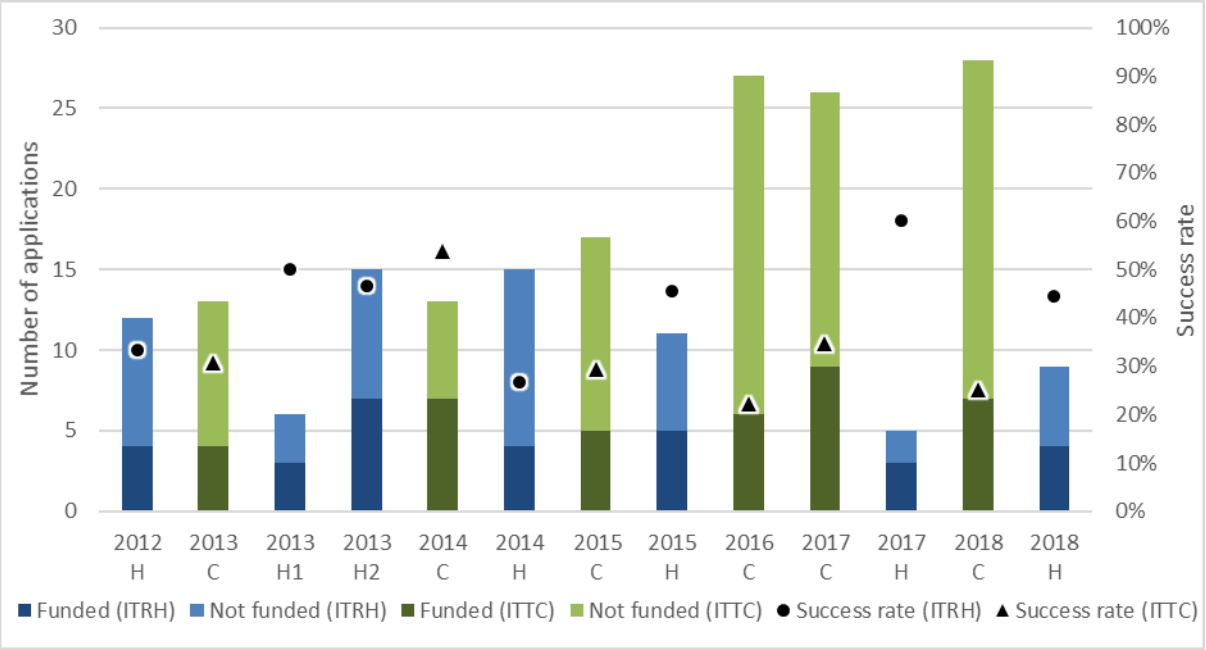
Applications and funding

Among ARC schemes, the ITRP provides relatively large scale support to a small number of projects. A total of 30 Research Hubs and 38 Training Centres have been funded under the ITRP since its inception.

As shown in Figure 1, the number of ITRP applications submitted has fluctuated between relatively small values, particularly in the ITRH. While ITRH applications peaked at 15 in the 2013 (round 2) and 2014 rounds, the number of ITTC applications has generally increased over time, with clearly more submitted in the 2016, 2017 and 2018 rounds (27, 26 and 28 applications, respectively).

Similarly, the number of funded projects has also fluctuated, with the ITRH peaking at seven projects in its second 2013 round and the ITTC reaching a peak of nine projects in its 2017 round. Success rates (the number of funded projects as a percentage of applications submitted) have also varied, ranging from 33 per cent (in 2012) to 60 per cent (in 2017) for the ITRH, and from 22 per cent (in 2016) to 54 per cent (in 2014) for the ITTC.

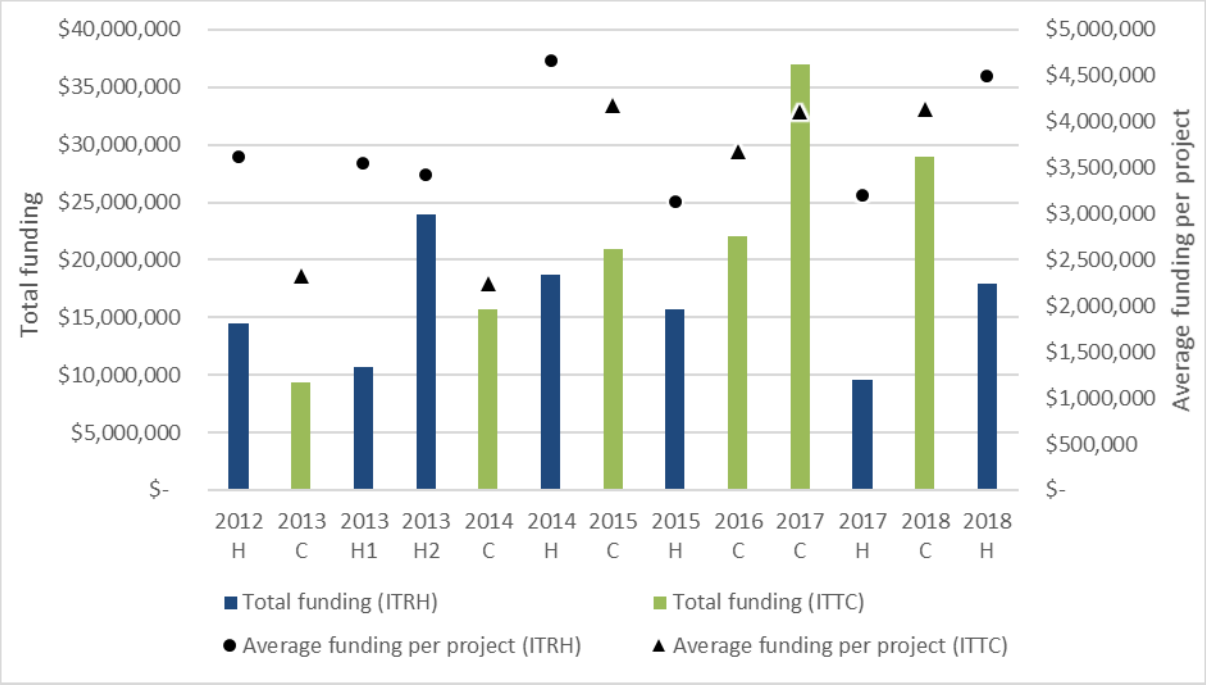
Figure 1: ITRP applications and success rates



Source: ARC data.

The total funding awarded in each ITRP round and the average funding awarded to each project have also fluctuated somewhat, as shown in Figure 2. For the ITRH, the pattern of total funding levels appears to broadly align with the number of funded projects, except in the 2014 round, when the average funding per project peaked at $4,670,467—over $1 million more than the average in every other ITRH round except 2018 ($4,492,975). Total ITTC funding increased in each round to 2017, when it jumped sharply to reach nearly $37 million, before dropping to its second highest total of just under $29 million in 2018. In line with changes in the ITTC funding rules, the average ITTC funding per project was notably lower in the 2013 and 2014 rounds (when the funding period was three years) than in the 2015-2018 rounds (when the funding period was four to five years).

Figure 2: Total and average funding awarded



Source: ARC data.

Given the relatively small numbers of ITRP applications and funded projects overall, it is difficult to identify many significant trends in these data. Furthermore, the focus, characteristics and operation of different Research Hubs and Training Centres vary greatly, creating additional challenges in attempting to draw clear conclusions from the data alone.

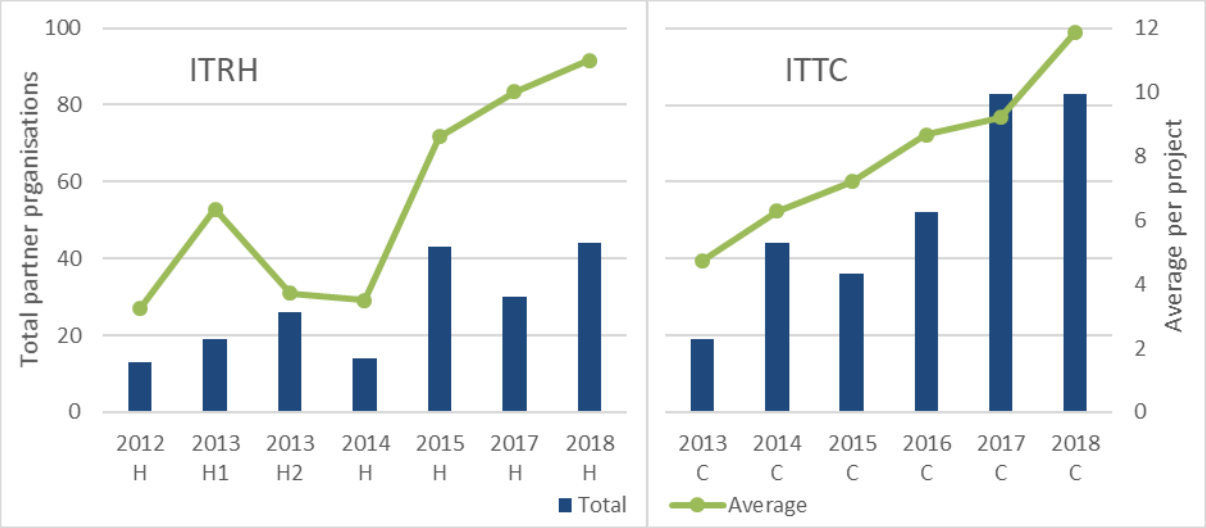
Number of partner organisations

The ITRP is designed to support collaboration between university researchers and industry and other research end users. As shown in Figure 3, the number of partner organisations involved in funded projects has increased over time at both the scheme round and project (i.e. Research Hub or Training Centre) levels, which may indicate that the ITRP's effectiveness in supporting collaboration has improved as it has matured—though not always consistently.

The number of ITRH partner organisations grew from 13 in the 2012 round to 44 in the 2018 round, and the ITTC saw an increase from 19 in the 2013 round to 83 in both 2017 and 2018, when it attracted considerably more partner organisations than the ITRH.

The average number of partner organisations per Research Hub grew from 3.25 in the 2012 round to 11 in 2018, although this was interrupted by declines in 2013 round 2 and 2014. The average per Training Centre grew steadily from 4.75 in 2013 to 11.86 in 2018.

Figure 3: Partner organisations (funded projects) – total and average per project



Source: ARC data.

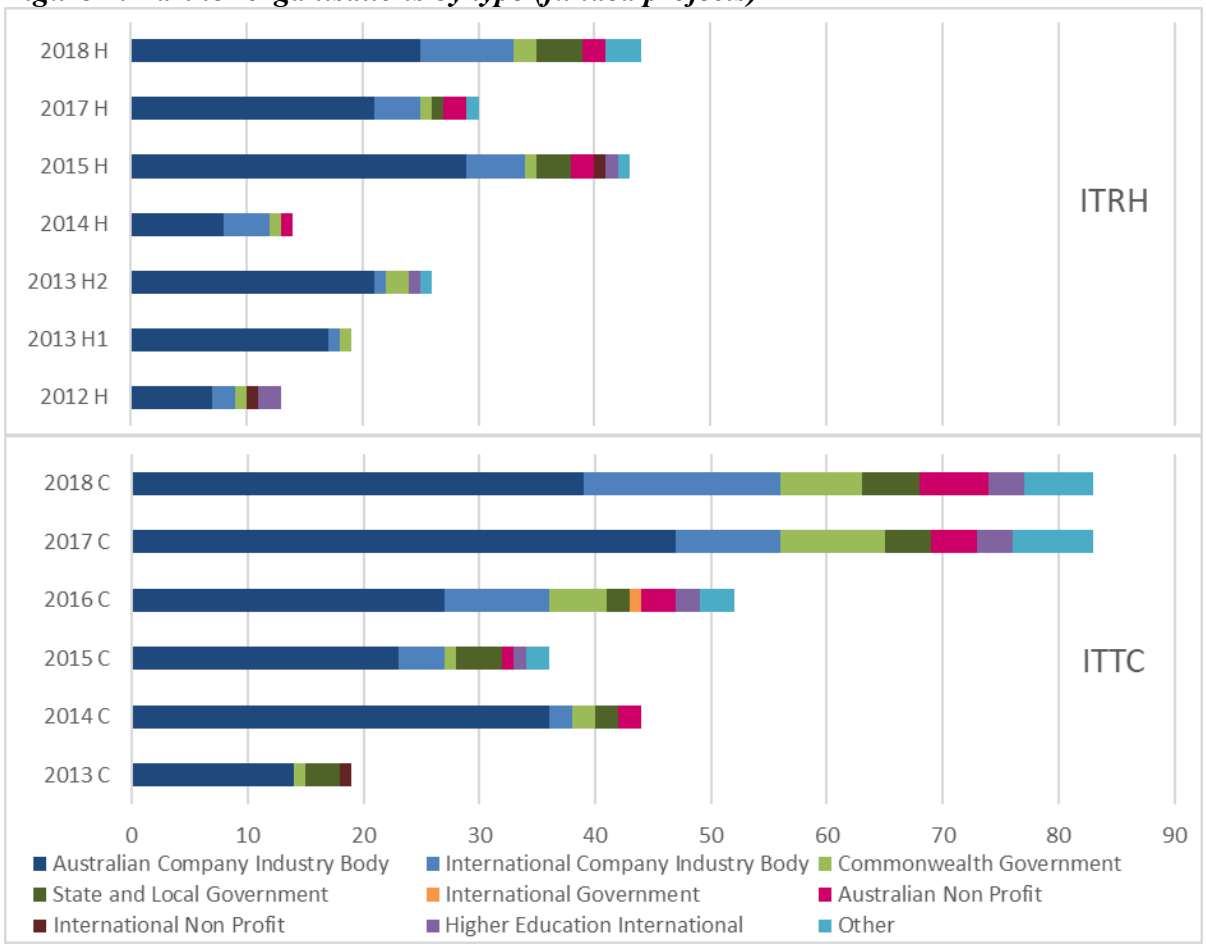
Types of partner organisations

Figure 4 shows the types of partner organisations involved in the ITRP. Consistent with the ITRP's focus on industry issues, 75 per cent have been from industry and business (identified as 'Australian Company Industry Body' and 'International Company Industry Body').

The ITTC has attracted a slightly more diverse mix of partner organisation types than the ITRH. In the ITRH, 81 per cent of partner organisations have been from industry and business, and 9 per cent have been government organisations (Commonwealth, State and Local, and International). By contrast, 72 per cent of ITTC partner organisations have been from industry and business, and 15 per cent have been government organisations. In both schemes, around five per cent have been non-profit organisations, and the remainder ('Higher Education International' and 'Other') have accounted for around 5 per cent of partner organisations in the ITRH and 9 per cent in the ITTC.[7]

[7] ARC data. Note: ITTC figures do not total 100 per cent due to rounding.

Figure 4: Partner organisations by type (funded projects)



Source: ARC data.

Over the life of the ITRP to 2018 H and 2018 C, 16.4 per cent of partner organisations on funded projects have been international. The proportion has been the same in both the ITRH and the ITTC. While the total number of international organisations in the ITRH has fluctuated between rounds (from one in 2013 H1 to eight in 2018 H), the total number in the ITTC has increased quite consistently (from one in 2013 C to 20 in 2018 C).[8]

Partner organisation contributions

Figure 5 shows the total partner organisation cash and in kind contributions for each ITRP round. As with the application and funding data discussed above, it is difficult to draw many clear conclusions from these data as they are based on a small number of considerably different Research Hubs and Training Centres. However, there are clear differences in the nature of the contributions that have been provided over the life of the ITRH (52 per cent cash, 48 per cent in kind) and the ITTC (26 per cent cash, 74 per cent in kind).[9]

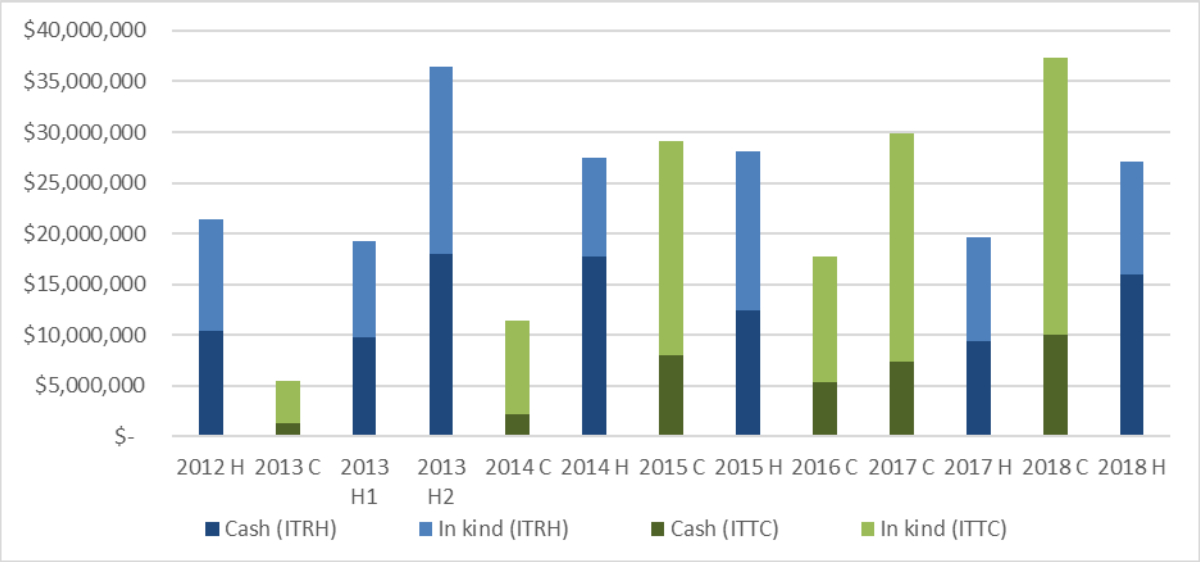
These differences reflect distinct requirements of the two schemes. In the ITRH, the combined cash and in kind contributions from partner organisations must match or exceed the funding requested from the ARC. In addition, where any partner organisation has more than 100 employees, the combined partner organisation cash contributions must be at least 75 per cent of the funding requested from the ARC. The ITTC, in contrast, requires that cash and in

[8] ARC data.
[9] ARC data.

kind contributions (along with the requested ARC funding) be sufficient to support all research projects described in the application, particularly those of HDRs and PDRs.[10]

It is interesting to note that the value of combined cash and in kind contributions from partner organisations has amounted to 154 per cent of the total funding requested from the ARC in successful ITRH applications and 92 per cent in successful ITTC applications.[11]

Figure 5: Total partner organisation contributions (funded projects)

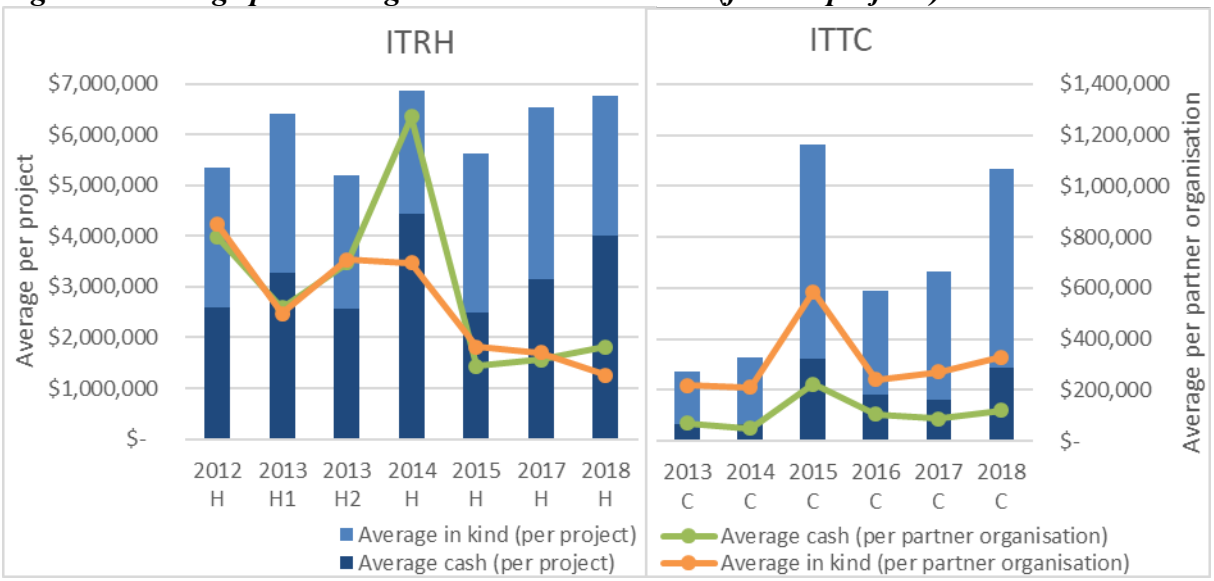


Source: ARC data.

Figure 6 provides additional insights into the nature of partner organisation contributions at the funded project and individual partner organisation levels. In particular, it shows that, on average, Research Hubs have tended to attract higher value contributions than Training Centres, particularly in relation to cash contributions (consistent with the discussion above). It also shows that ITTC partner organisations' average in kind contributions have been consistently higher than their cash contributions, but the balance between average ITRH partner organisations' cash and in kind contributions has tended to be more even (with the exception of the 2014 round, in which one of the four funded projects involved a particularly low level of in kind contributions).[12]

[10] These requirements have been specified in the funding rules and grant guidelines for all ITRH and ITTC rounds. See www.arc.gov.au > Grants > Grant application > Funding Rules/Grant Guidelines > Linkage Program Funding Rules/Grant Guidelines; and www.grants.gov.au > Forecast Opportunity View - ITRP2019.
[11] ARC data.
[12] ARC data.

Figure 6: Average partner organisation contributions (funded projects)



Source: ARC data.

ITRP support for industry focused research training

Number of HDR students and PDRs involved

ARC data collections do not currently provide for accurate reporting on the total number of HDR students and PDRs involved over the life of each Research Hub and Training Centre. This is an especially important issue for monitoring the performance of the ITTC (which has an objective to 'support opportunities for HDR candidates and postdoctoral researchers to pursue industrial training'), but is also relevant to the ITRH (which can support industrial research training, but does not have a specific objective to do so).

The funding rules and grant guidelines for all ITTC rounds since 2013 have reflected the intention that ARC funding for each Training Centre should support stipends for at least ten HDR candidates and salaries for at least three PDRs.[13] Since the 2016 ITTC round, applicants have been asked for how many HDR students and PDRs ARC funding was requested. Across the three subsequently completed ITTC rounds (2016 C, 2017 C and 2018 C), successful applications requested funding for an average of 12.2 HDR students and 3.9 PDRs.[14] However, these data do not indicate how many research trainees actually are (or have been) involved.

Training Centres and Research Hubs provide further information on their research training activities through annual progress reports to the ARC, which record their performance against agreed Key Performance Indicator (KPI) targets for each year (for example, number of HDR students enrolled at a Training Centre). Given that HDR students or PDRs may be enrolled or employed over multiple years, these annual reports cannot be used to provide reliable insights on levels of research training activity over the life of a Research Hub or Training Centre.

To enable ARTD Consultants to conduct surveys of HDR students and PDRs as part of this evaluation, the ARC sought contact details for 'all current and past research trainees involved in' each Research Hub and Training Centre. The data from Research Hubs and Training Centres that provided responses give a very rough indication of the scale of research training

[13] See www.arc.gov.au > Grants > Grant application > Funding Rules/Grant Guidelines > Linkage Program Funding Rules/Grant Guidelines; and www.grants.gov.au > Forecast Opportunity View - ITRP2019.
[14] ARC data.

supported by the ITRP. As shown in Table 1. Research Hubs provided contact details for an average of 17 HDR students and seven PDRs, while the numbers for Training Centres were 15 and five, respectively.

Note that the ARC's request did not ask Research Hubs and Training Centres to identify whether the contacts were current or past research trainees, or to elaborate on the nature of their involvement (that is, whether they were enrolled/employed, undertook placements, received mentoring, or were involved in other ways). Therefore, these numbers can only be considered as broadly indicative. Some insights into the number of research trainees who undertook placements are provided in the survey responses discussed in Appendix 2, indicating an average of five HDR and four PDR placements in Research Hubs, and six HDR and two PDR placements in Training Centres.[15]

Table 1: Average number of research trainees involved in Research Hubs and Training Centres

	ITRH	ITTC
HDR	16.6	15.0
PDR	7.4	4.9

Source: ARC data. *Note: Data derived from contact details provided to the ARC by Research Hubs (n=19) and Training Centres (n=14) to enable HDR and PDR surveys to be conducted by ARTD Consultants.*

To support improved monitoring and evaluation of ITRP support for industry focused research training, the ARC may wish to consider collecting further information through Training Centre and Research Hub final reports. This should include data on the total number of HDR students and PDRs who participated over the life of the Training Centre or Research Hub, the nature of their involvement (enrolled, employed, placement, mentoring or other involvement), whether they completed their training, and whether they were supported by ARC funding, partner organisation contributions, or other sources.

While the outcomes of ITRP funded research activity were outside the scope of this evaluation, the surveys conducted with HDR students and PDRs did ask whether they had completed their ITRP supported training, and if so, whether they were in further study or employment (and in which sector).[16] To better understand ITRP research trainees' employment and other outcomes, and their perspectives on the value of participation in the ITRP, the ARC may wish to consider building upon these survey questions to inform more detailed and targeted surveys with HDR students and PDRs in future.

Engagement with Industry Growth Centres

Stakeholder feedback indicated some uncertainty and a need for greater clarity regarding aspects of the Growth Centres' role in the ITRP application and assessment processes, including whether they play an advocacy role or are involved in assessing applications.[17] The ITRP funding rules for funding commencing in 2018 did state that applications 'may be subject to additional assessment, such as…consultation with the Industry Growth Centres',[18] but they did not elaborate on what this entailed.

[15] ARTD Consultants, Appendix 2, p. 15.
[16] ARTD Consultants, Appendix 2, pp. 15-16.
[17] ARTD Consultants, Appendix 2, pp. 18-19.
[18] *Funding Rules for schemes under the Linkage Program (2017 edition)*, paragraphs B10.1.1 (for ITRP) and C11.1.1 (for ITTC). See www.arc.gov.au > Grants > Grant application > Funding Rules/Grant Guidelines > Linkage Program Funding Rules/Grant Guidelines.

This lack of clarity has been addressed in the latest ITRP grant guidelines (for funding commencing in 2019), which provide the following advice regarding the provision of applications to Growth Centres during the assessment process:

'Applications may be provided to the relevant Industry Growth Centre, subject to any Conflicts of Interest. Applications will not be provided to the relevant Industry Growth Centre when that Growth Centre is listed as a Partner Organisation in an application. If asked, the Growth Centre provides comments to [the ARC] on the applications for the [Selection Advisory Committee]'s consideration.'[19]

There may be value in the ARC seeking the views of ITRP stakeholders—through its regular engagement and outreach activities (for example, forums, induction sessions and feedback surveys)—on whether they perceive this advice to have clarified the role of the Growth Centres.

ITRP fit with other Australian Government programs

Industrial Transformation Priorities

The funding rules and grant guidelines for all ITRP rounds (except 2013 C) have required that applications address one or more of the Industrial Transformation Priorities in order to be eligible. Addressing the priorities has also been included within in the selection criteria for each round.[20]

The Industrial Transformation Priorities have changed a number of times over the life of the ITRP. These changes are detailed in Table 2, where the priorities for different ITRP rounds are grouped into six broad priority areas that have been used for the purposes of the analysis in this section. Initially, there were five priorities in the area of Food for 2012 H and 2013 C, and four priorities in Manufacturing were added for 2013 H1 and 2014 C. These were revised from 2013 H2 and 2015 C to include one Food priority and one Manufacturing priority, along with additional priorities in the areas of Oil and gas, Mining and Medical technology. Cyber security was added as a sixth priority for 2018 H and 2018 C.

[19] *Grant Guidelines for the Industrial Transformation Research Program (2018) for funding commencing in 2019*, paragraph 9.14.f. See www.grants.gov.au > Forecast Opportunity View - ITRP2019.
[20] See www.arc.gov.au > Grants > Grant application > Funding Rules/Grant Guidelines > Linkage Program Funding Rules/Grant Guidelines; and www.grants.gov.au > Forecast Opportunity View - ITRP2019.

Table 2: Industrial Transformation Priorities

Priority area	ITRP rounds	Industrial Transformation Priorities
Food	2012 H; 2013 C	Future food storage; Food processing; Manufacturing capabilities; Product opportunities; Other food related research
	2013 H1; 2014 C	Future food storage; Food processing; Food manufacturing capabilities; Product opportunities; Other food related research
	2013 H2; 2014 H; 2015 C	Food and agriculture
	2015 H; 2016 C; 2017 C; 2017 H; 2018 C; 2018 H	Food and agribusiness
Manufacturing	2013 H1; 2014 C	Product design and development; Manufacturing techniques; Defence manufacturing; Firm organisation and management
	2013 H2; 2014 H; 2015 C	Manufacturing
	2015 H; 2016 C; 2017 C; 2017 H; 2018 C; 2018 H	Advanced manufacturing
Oil and gas	2013 H2; 2014 H; 2015 C	Oil and gas, including petroleum
	2015 H; 2016 C; 2017 C; 2017 H; 2018 C; 2018 H	Oil, gas and energy resources
Mining	2013 H2; 2014 H; 2015 C	Mining and mining services
	2015 H; 2016 C; 2017 C; 2017 H; 2018 C; 2018 H	Mining equipment, technology and services
Medical technology	2013 H2; 2014 H; 2015 C	Medical devices and biotechnology
	2015 H; 2016 C; 2017 C; 2017 H; 2018 C; 2018 H	Medical technologies and pharmaceuticals
Cyber security	2018 C; 2018 H	Cyber Security

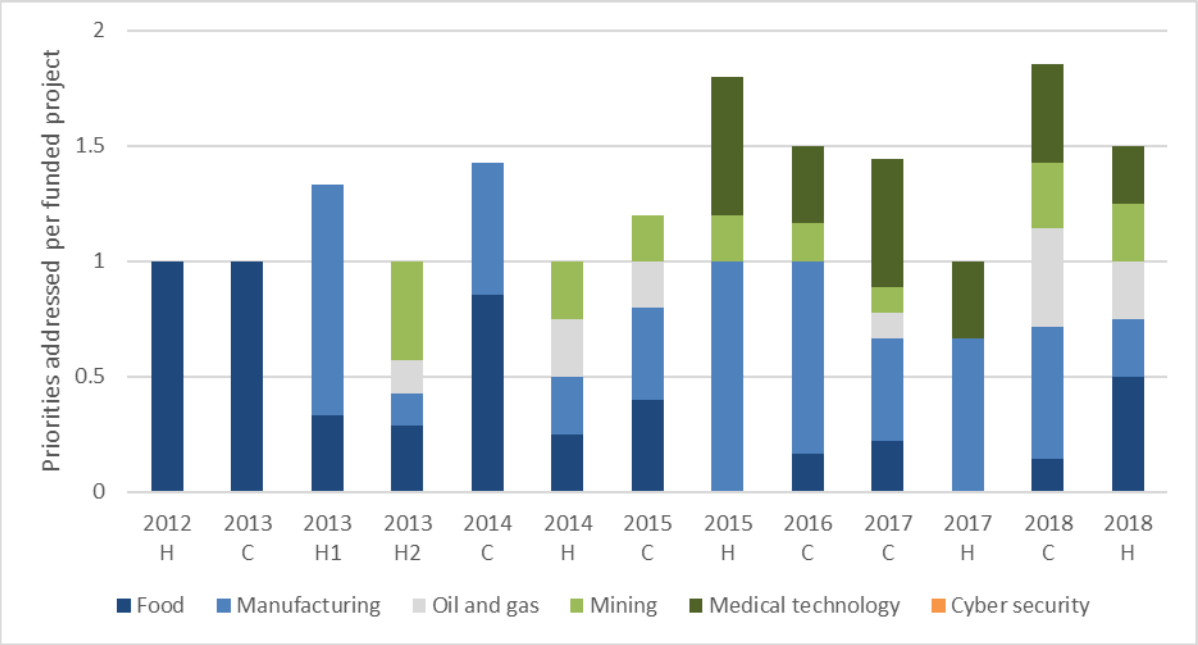
While stakeholders who participated in interviews generally felt that the Industrial Transformation Priorities effectively focus applications on key industry priority areas, some perceived them to have gaps or to be narrow, or felt that under the ITRP some areas receive more focus than others.[21]

Figure 7 provides some insights into the extent to which the different priority areas have been addressed by funded projects in each ITRP round. It shows the average number of priorities addressed per funded project (y axis), and the proportion that each priority area represented in each round (colours within bars). For example, in 2015 H:

- funded projects addressed an average of 1.8 priorities
- three priority areas were addressed across all funded projects, with Manufacturing addressed most often (56 per cent of all instances), followed by Medical Technology (33 per cent) and Mining (11 per cent).

[21] ARTD Consultants, Appendix 2, pp. 26-27.

Figure 7: Industrial Transformation Priorities addressed per funded project (average)

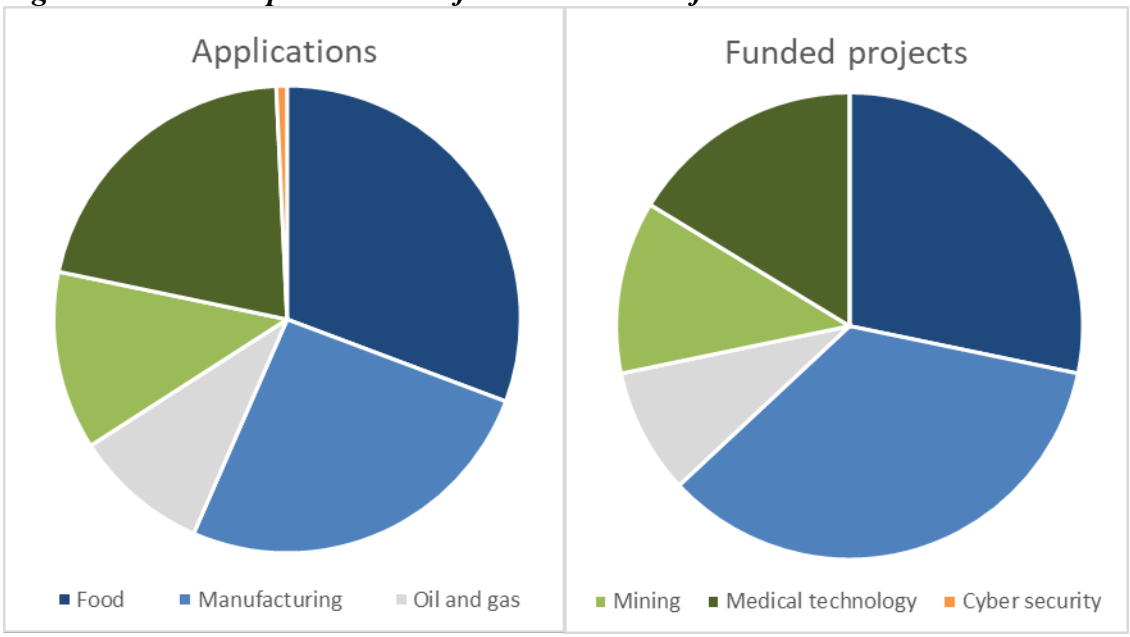


Source: ARC data. *Note: Priority areas are as outlined in Table 2. Where a project from 2012 H, 2013 H1, 2013 C or 2014 C addressed more than one priority in the areas of Food or Manufacturing, these have been consolidated. For example, a project in 2013 C addressing three different Food priorities would be counted as addressing only one priority (Food). A project in 2013 H1 addressing one Food priority and two Manufacturing priorities would be counted as addressing only two priorities (Food and Manufacturing).*

Overall, Manufacturing has been the most commonly addressed priority area, having been introduced early in the life of the ITRP and tending to remain comparatively prominent from round to round. This has been followed by Food, which was the only priority area for the first rounds of the ITRP, but has tended to feature less in more recent rounds. While Medical technology was included in the priorities for 2013 H2, 2014 H and 2015 C, it was not addressed in any funded projects in those rounds, but has been fairly consistently represented in subsequent rounds. Cyber security, which was introduced for 2018 H and 2018 C, has not yet been addressed in any funded project.

To provide a higher level picture, Figure 8 shows the priorities' aggregate representation in applications and funded projects since the ITRP commenced. The proportions appear quite similar with respect to applications and funded projects—and for Mining (12 per cent) and Oil and gas (nine per cent), they are the same. This suggests that the level of focus on each priority has largely been driven by the content of the applications submitted. However, the success of research in different areas has varied somewhat. Manufacturing has been better represented in funded projects (35 per cent) than in applications (26 per cent), indicating that research in that area has fared relatively well in the ITRP process. Conversely, research in Medical technology (21 per cent in applications, 16 per cent in funded projects), Food (31 per cent in applications, 28 per cent in funded projects) and Cyber security (one per cent in applications, not yet addressed in any funded projects) has been less successful.

Figure 8: Overall representation of Industrial Transformation Priorities



Source: ARC data. *Note: Priority areas are as outlined in Table 2. Priorities addressed in applications and funded projects have been counted as outlined in Figure 7 and aggregated across all ITRP rounds to 2018 C and 2018 H.*

Alignment of priorities with Industry Growth Centre priority areas

Beyond the role of the Growth Centres in the ITRP assessment process (discussed under 'Engagement with Industry Growth Centres', above), there is a level of ambiguity in the way the Growth Centres' relationship to the Industrial Transformation Priorities is addressed.

The Industrial Transformation Priorities have aligned with (in fact, exactly matched) the Growth Centre priority areas since that initiative was introduced in 2015. This construction underpins the focus in the ITRP on engagement between applicants and Growth Centres to ensure support for research and research training in government identified priority areas. However, while addressing the Industrial Transformation Priorities is an ITRP eligibility requirement (as discussed above), engagement with the Growth Centres is not expressed as being mandatory. The most recent grant guidelines state that:

'The research and training programs of the proposed Research Hub or Training Centre must address one or more of the Industrial Transformation Priorities. Prior to applying, potential applicants are strongly encouraged to engage with the relevant industry growth centre.'[22]

Engagement with the Growth Centres is then captured in an assessment criterion for both the ITRH ('the extent to which the proposed Research Hub engages, and will continue to engage, meaningfully with the relevant Industry Growth Centre(s)')[23] and the ITTC ('the extent to which the proposed Training Centre will engage meaningfully with the relevant Industry Growth Centre(s)').[24] It should also be noted that, despite being nearly identical, these criteria appear under different categories for the ITRH ('Benefit') and the ITTC ('Feasibility and Commitment').

While the importance of engagement with Growth Centres is also emphasised in other ARC advice (including through forums and other outreach activities), the Growth Centres initiative

[22] *Grant Guidelines for the Industrial Transformation Research Program (2018) for funding commencing in 2019*, paragraph 3.6. See www.grants.gov.au > Forecast Opportunity View - ITRP2019.
[23] Ibid, paragraph A5.1c.
[24] Ibid, paragraph B5.1b.

sits outside the ARC's control and it is not possible for the ARC to enforce that engagement as part of the ITRP process. Indeed, some survey and interview participants—albeit a minority—reported difficulties in engaging with Growth Centres, including a lack of responsiveness.[25]

In light of these tensions, some revisions to the design of the ITRP process and priorities may be possible to help clarify the Growth Centres' role and allow more flexibility to address concerns, discussed above, that the Industrial Transformation Priorities have gaps or are too narrow. For example, the ARC may wish to consider all or some elements of the following approach:

1. In the ITRP grant guidelines, retain the requirement for applications to address one or more of the Industrial Transformation Priorities.
2. Continue to include all Industry Growth Centre priority areas in the Industrial Transformation Priorities but also consider the inclusion of additional priorities beyond the scope of the Growth Centres for each round. These additional priorities should be identified in consultation with appropriate stakeholders, including relevant ministers and DIIS, to ensure consistency with the ITRP's purpose of supporting industry growth in areas that are important to Australia.
3. Amend the ITRP guidelines so that rather than *strongly encouraging* potential applicants to engage with the relevant Growth Centres, they *require* applicants to engage with relevant industry experts (such as, but not exclusively, Growth Centres) to ensure the proposed research is targeted to support growth in the relevant Industrial Transformation Priority areas.
4. Amend the ITRH and ITTC assessment criteria so that rather than describing the extent to which a Research Hub or Training Centre will 'engage meaningfully' with the relevant Growth Centres, applicants are required to describe the ways in which engagement with industry experts (such as, but not exclusively, Growth Centres) has ensured that the proposed research is targeted to support growth in the relevant Industrial Transformation Priority areas.
5. Noting that ITRP Selection Advisory Committees include members with relevant industry expertise, the ARC would need to ensure this expertise covered any additional priority areas identified for each round.

These changes would provide extra flexibility and remove ambiguities associated with the ARC's lack of control over the operation of the Growth Centres, while allowing the ITRP to continue to align with them. Given the important role of the Growth Centres in Australia's innovation policy landscape, the ARC should continue to work closely with DIIS and the Growth Centres in relation to their interaction with the ITRP and continue to emphasise the value of engagement with the Growth Centres in its ITRP advice and outreach activities.

[25] ARTD Consultants, Appendix 2, pp. 18-19.

APPENDIX 2: Survey and interview findings report (ARTD Consultants)

SURVEY AND INTERVIEWS FOR THE EVALUATION OF THE INDUSTRIAL TRANSFORMATION RESEARCH PROGRAM

AUSTRALIAN RESEARCH COUNCIL

FINDINGS REPORT

2 APRIL 2019

ARTD CONSULTANTS
strategy & evaluation

Acknowledgments

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Contents

Abbreviations and acronyms

ARC	Australian Research Council
CI	Chief investigator
CRC	Cooperative Research Centres
CRC-P	Cooperative Research Centres Projects
DIIS	Department of Industry, Innovation and Science
Dir	Director
ERA	Excellence in Research Australia
HDR	Higher degree by research (e.g. Honours, Masters or PhD) student
IGC	Industry Growth Centre
IP	Intellectual Property (e.g. patents, trademarks, copyright)
ITTC	Industrial Transformation Training Centre
ITRH	Industrial Transformation Research Hub
ITRP	Industrial Transformation Research Program
Mgr	Manager
PI	Partner investigator
PDR	Post-doctoral researcher
R&D	Research and development
RO	Research Office
SME	Small to medium enterprise

Executive summary

Project

This report presents the findings of a survey and interview process with stakeholders of the Industrial Transformation Research Program (ITRP). These findings are being used to support the ARC's broader project to evaluate the alignment of the ITRP with government priorities, and the efficiency and effectiveness of ITRP in supporting collaborations to deliver research and research training. ARTD delivered two surveys and a series of 33 interviews with key stakeholders of the ITRP. The survey and interviews targeted a subset of the evaluation questions for the broader ITRP evaluation. The surveys received a total of 707 complete responses.

Key findings

- Overall, respondents feel that the ITRP effectively supports industry focused research collaboration. Collaborations for ITRP projects have mostly been initiated through existing relationships. In terms of the role of partner organisations in the ITRP application and design process, there appears to be differences in views from stakeholders on the level of consultation activities.

- Stakeholders feel that the ITRP does well in supporting research training, and they feel it is of high academic quality and relevance. That being said, students and post-doctoral researchers expressed a desire to see more training opportunities.

- Industry Growth Centres (IGCs) are generally seen as beneficial in identifying and enabling partnerships; however, many stakeholders were unclear as to the role that they play in the application and assessment process. Some stakeholders also found IGCs difficult to engage with in a timely manner.

- The ITRP is perceived by stakeholders to be unique in its scope and focus on research training, and a good complement to other Australian Government programs. However, there is some perceived overlap with the CRC and CRC-P programs.

- For most stakeholders the ITRP process is considered both effective and efficient. The major issues raised were around the timeframes for preparation of applications, the amount of information required for applications, and negotiating and establishing collaborations with partners.

- In general, respondents agreed that the ITRP both fosters important research partnerships and supports research trainees to gain skills in industry priority areas.

1. Introduction

1.1 The project

1.1.1 Purpose

The purpose of this work is to support the ARC's broader project to evaluate the alignment of the ITRP with government priorities, and the efficiency and effectiveness of ITRP in supporting collaborations to deliver research and research training. The evaluation as a whole will focus primarily on the design, implementation and administration of the ITRP. The findings will be used to inform changes and improvements in the administration of future ITRP rounds.

1.2 Scope and focus of project

To support the broader evaluation, ARTD delivered a survey instrument and a series of interviews with key stakeholders of the ITRP. The survey and interviews targeted a subset of the evaluation questions.

The stakeholder groups targeted as part of these activities were:

- Research offices at universities involved with successful applications for ITRP funding
- ITRH and ITTC directors and managers involved with successful applications for ITRP funding
- Chief investigators involved with successful applications for ITRP funding
- Partner investigators involved with successful applications for ITRP funding
- Higher degree by research students (HDRs) and post-doctoral researchers (PDRs) who had undertaken research training within a Research Hub or Training Centre
- Industry Growth Centre (IGCs) representatives
- Department of Industry, Innovation and Science (DIIS) representatives
- ARC policy and program owners.

The scope of this work did not extend to a broader evaluation of the scheme, or the outcomes and impacts of research projects supported under the scheme.

2. Methodology

2.1 Surveys and interviews

2.1.1 Survey and interview development

To develop the surveys and interviews, ARTD facilitated a half-day workshop with key ARC stakeholders in Canberra to:

- prepare and confirm a survey framework covering the key areas of investigation
- further develop question themes and language for the survey and interviews
- align questions and survey logics with stakeholder groups[1]
- ensure that language reflected ARC communication styles, tone and program policy
- obtain relevant stakeholder information and contact details, and discuss engagement strategies for stakeholders as part of the survey and interview process
- finalise questions proposed for inclusion in the survey instrument and interview guides
- confirm the sampling frame and approach to be taken in communicating with stakeholders.

This workshop enabled the development of survey instruments and interview guides in collaboration with the ARC Program Evaluation section.

2.1.2 Surveys

A survey was delivered across members of the following stakeholder groups (where contact details were available):

- Research offices at universities involved with successful applications for ITRP funding
- ITRH and ITRC directors and managers involved with successful applications for ITRP funding
- Chief investigators involved with successful applications for ITRP funding
- Partner investigators involved with successful applications for ITRP funding
- HDR students and PDRs who had undertaken research training within a Research Hub or Training Centre

Survey questions were tailored to ensure that respondents were presented with questions relevant to their role and experience with the ITRP. A separate survey (IGC Survey) was also developed and delivered to IGC representatives, which focused on their interactions with Research Hub and Training Centre applicants.

[1] With the exception of questions aimed at ARC and Industry Growth Centre stakeholders which were separately vetted by the Program Evaluation section at the ARC.

Survey response

The survey was delivered between 6 February 2019 and 28 February 2019 to a distribution list of 2,177 stakeholders. Reminder emails were sent on a weekly basis and 24 hours prior to closure of the survey.

A total of 702 complete responses to the survey were received, representing a response rate of 32.3 per cent. A further 302 partial responses were received which have not been included in the analysis or final data set. More detail on the survey delivery and response rates are provided at Appendix 1. Breakdowns of survey respondents by demographic are provided at Appendix 2.

The IGC survey was delivered between 11 February 2019 and 28 February 2019 to six representatives from IGCs. Reminder emails were sent one week after launch, followed by phone calls to remaining representatives. Five of the six representatives provided a response to the survey.

2.1.3 Interviews

A total of 33 interviews were delivered alongside the survey to members of the following stakeholder groups (numbers of interviews in brackets):

- University Research Office representatives (seven)
- Hub and Centre directors and managers (20 interviews, representing ten Research Hubs and ten Training Centres)
- ARC representatives (two)
- DIIS representatives (two, from the policy and IGC management areas).

The interviews were designed to probe topics from the survey in greater depth. For Research Office, Research Hub and Training Centre interviews a purposive sampling approach was used to provide a balance across factors such as geography, university type, number of Research Hubs and Training Centres at a university, and rounds of the program.

3. Summary of responses

3.1 Support for industry focused research collaboration

Effectiveness of ITRP support for industry focused research collaboration

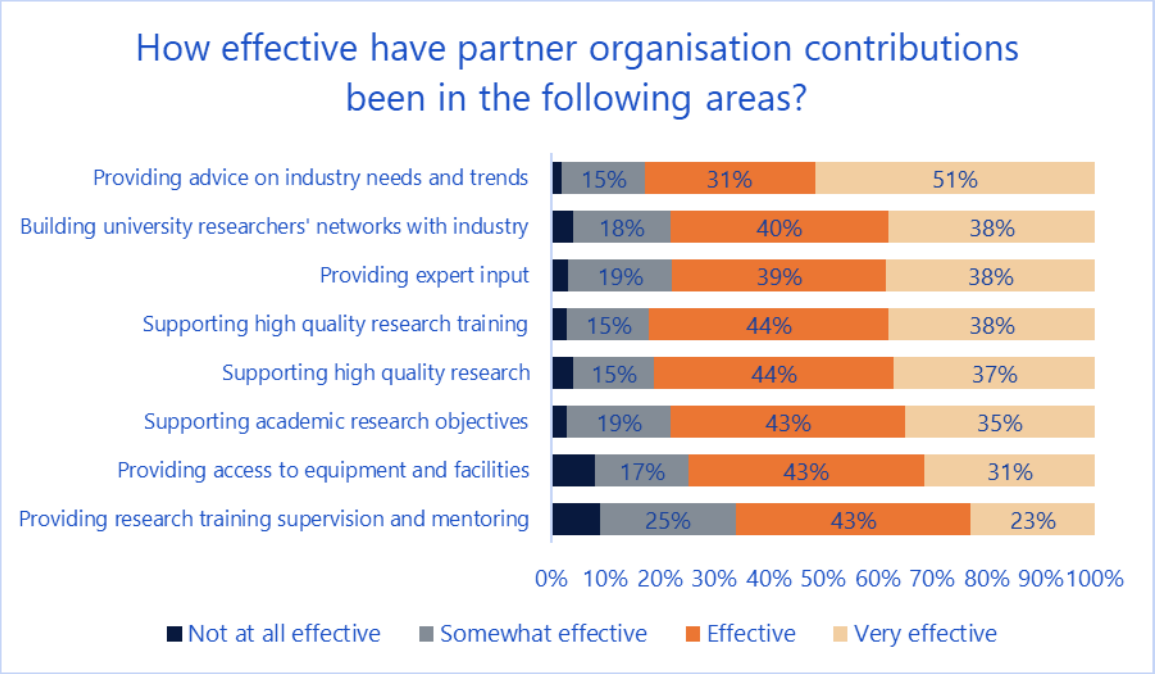
Figure 1 shows responses for Directors (Dirs) and Partner Investigators (PIs) on the effectiveness of the research programs in their Research Hubs and Training Centres in supporting collaboration to meet industry needs in a range of areas. Respondents felt that industry access to research expertise was the most effective area, with intelligence on research and industry trends being less effective. Broken down by group, however, there are differences with higher ratings from respondents from Research Hubs across all factors except providing research candidates with skills and knowledge needed for industry employment (which may reflect the differing objectives of Research Hubs and Training Centres). Dirs also provided higher ratings than PIs across all factors.

Figure 1. Effectiveness of research program and projects in supporting collaboration

Figure 2 shows the effectiveness of partner organisation contributions in helping to achieve different aspects of university researchers' needs and goals in undertaking collaborative research, as reported by Dirs and Chief Investigators (CIs). Advice on industry needs was seen as most effective, while supervision and mentoring were seen as least effective. Research hub respondents found contributions to be more effective than for Training Centres in all but the

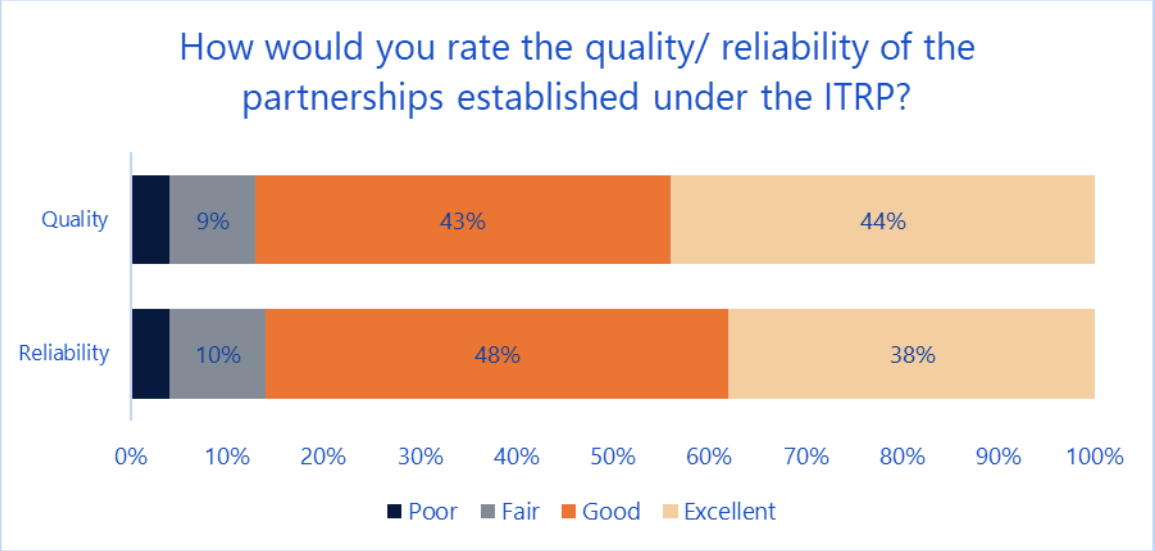
areas of expert input, supervision and mentoring, and building networks. Notably, Dirs saw partner organisation contributions as more effective on each dimension as compared to CIs.

Figure 2. Effectiveness of partner contributions in supporting collaboration



Research Offices (ROs), Dirs, Managers (Mgrs), CIs and PIs were asked for their views on the quality and reliability of partnerships; these were generally rated as good or excellent (Figure 3). However, broken down by group there were large differences in whether these partnerships were rated "good" or "excellent", with ROs more likely to rate the quality and reliability as "good" and Dirs more likely to rate quality and reliability as "excellent".

Figure 3. Quality and reliability of partnerships



Of 73 verbatim comments from ROs, Dirs, Mgrs, CIs and PIs on research collaboration, 39 per cent related to the quality and nature of partnerships (with mixed views within these comments). Other topics raised were processes for managing collaboration (nine per cent), knowledge sharing arrangements (five per cent) and alignment of academic and industry priorities and needs (five per cent). Twenty-three per cent of comments were generally positive about research collaboration, compared to 18 per cent which were generally negative in nature about their experiences.

Interviews with Dirs and with ARC and DIIS stakeholders found generally positive views on collaboration, and a view that the ITRP acted as a vehicle for bringing partners together that would not have otherwise collaborated.

> *[The ITRP] enables researchers to build long term relationships with multiple industrial partners at once on more than one project and often manages to bring together different partners that would never have seen each other. That I see as its key strength.*
>
> *- ARC representative*

Interviewees also felt that the ITRP allows long term collaborative relationships to develop between academia and industry. It also enables research collaboration between academia and industrial organisations that are of different sizes. One Training Centre Dir mentioned that industry sometimes does not have the internal means to conduct research, so universities can provide their capital to develop an R&D group, a situation ideally suited for small to medium enterprises.

Number of new versus existing collaborations facilitated through ITRP

Existing research collaborations with partner organisations were the most common way that collaborations have been initiated for Research Hubs and Training Centres, with 63 per cent of Dir and CIs listing this as the most common method. The next most common way was through approaches by respondents to potential partners (26 per cent) and then approaches by potential partners to respondents (7 per cent).

The perspective of PIs was similar for this question, with 57 per cent of respondents listing existing collaborations as the most common channel for initiation. Dirs and CIs reported on average that ten partner organisations came from existing research collaborations, though with a median of four organisations, suggesting large variations in numbers of partners. Dirs and CIs reported on average that six partner organisations came from new research collaborations, with a median of two organisations. However, new collaborators were more common for Training Centres, which had an average of eight new collaborations as compared to four for Research Hubs.

In terms of new partners joining after establishment, 57 per cent of respondents (Dirs, Mgrs and CIs) stated that this had occurred. This response was similar across both Research Hubs

and Training Centres. On average, three new partner organisations have joined Research Hubs and Training Centres since establishment (with a median of two organisations).

In terms of partners dropping out after establishment, 50 per cent of respondents (Dirs, Mgrs and CIs) stated that this had occurred. The predominant reason for organisations dropping out was due to changes in business conditions or strategy (49 per cent), followed by financial constraints on partners (37 per cent).

Ways industry partners are involved in the development of ITRP applications and the design of programs and projects

ROs, Dirs, CIs and PIs were asked questions on the ways in which industry partners were consulted in the application and design process. Eighty-five per cent of university respondents reported that partner organisations were consulted in the development of their Research Hubs and Training Centres' entire research programs. However, only 60 per cent of PIs reported that they or their organisations were consulted, which is a statistically significant difference. This may represent different perceptions on what constitutes consultation activities by both groups, and/ or that different partners play different roles in different projects.

Ninety-five per cent of university respondents reported that partner organisations were consulted on the development of sub-projects. Ninety per cent of PIs reported that they were consulted. This difference was not statistically significant.

Regarding whether partner organisations consulted with IGCs, 71 per cent of university respondents reported that this occurred. However, only 38 per cent of PIs responded that this had occurred. Again, this difference is statistically significant.

Dirs and CIs also listed in more detail the ways that partners were involved in the development and design process, with 32 per cent stating that partners had provided design advice, 25 per cent had engaged in or facilitated meetings with key stakeholders, ten per cent had provided market advice, and a further ten per cent had enabled linkages with other potential partners.

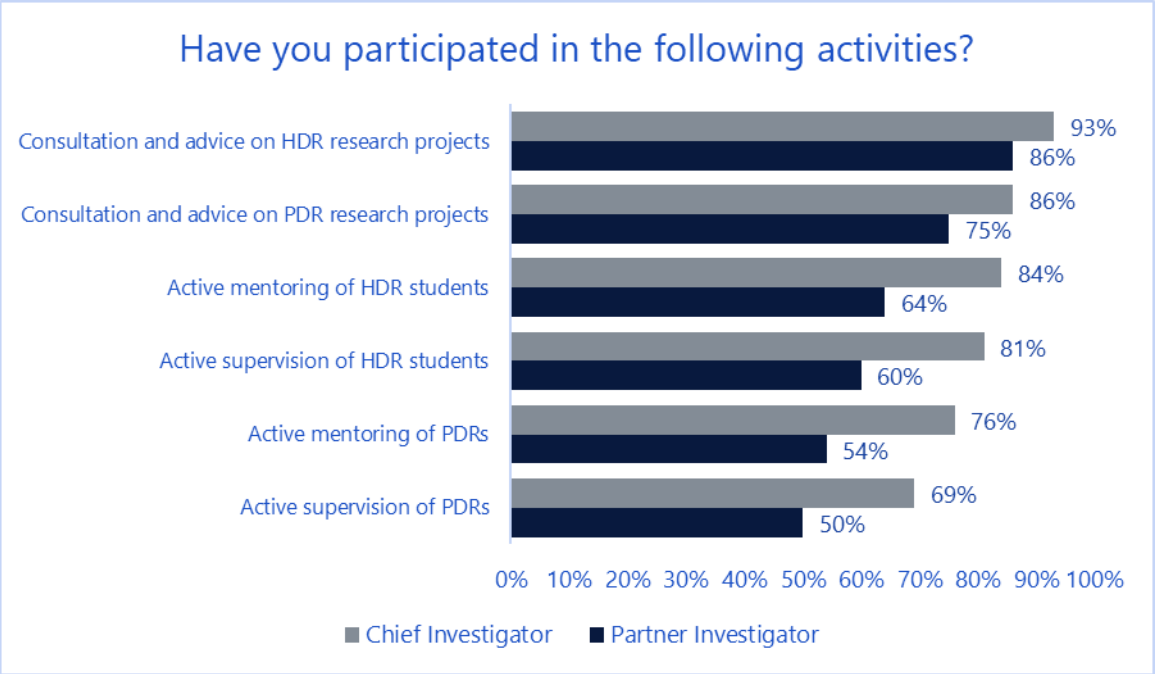
Of 50 verbatim comments from PIs on ways in which they were involved in the application process, 40 per cent related to the provision of expertise on industry. A further 40 per cent related to partnership activities and advice.

3.2 Support for industry focused research training

Effectiveness of ITRP support for industry focused research training

CIs and PIs both reported delivering a range of research training activities to HDRs and PDRs (Figure 4). CIs were most likely to report delivering mentoring and supervision activities.

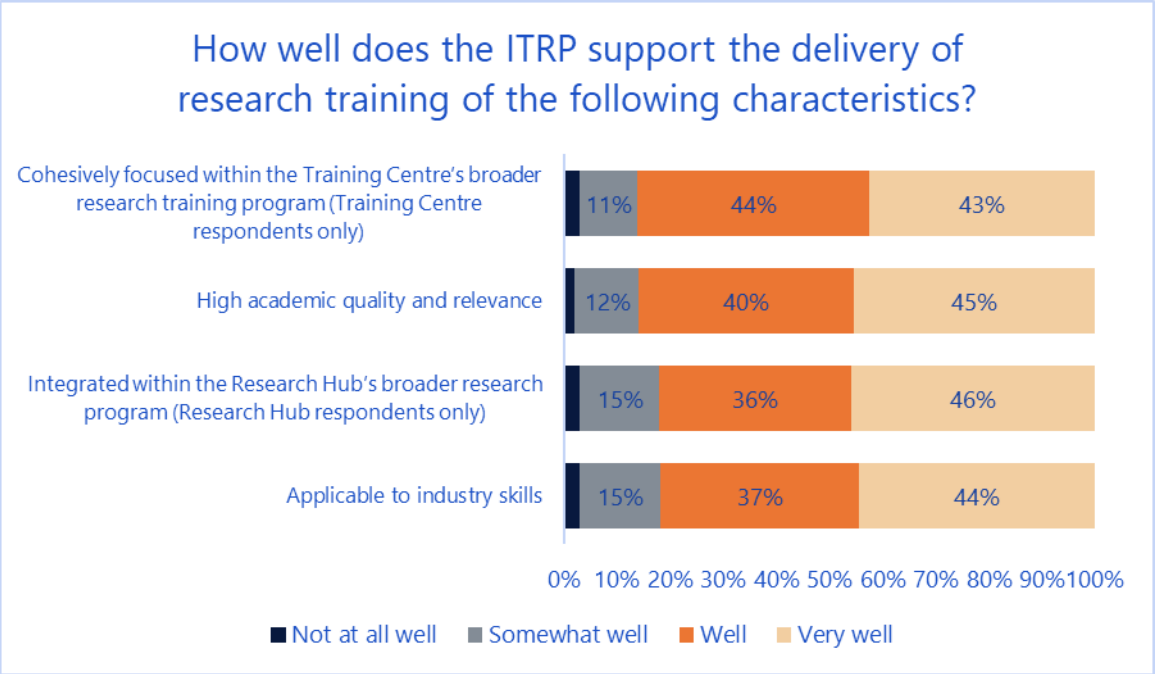
Figure 4. Involvement in research training



ROs, Dirs, CIs and PIs were asked how well the ITRP supports the delivery of research training across a range of dimensions (Figure 5). Over 80 per cent responded "well" or "very well" in respect of each dimension. By group, ROs tended to provide more "very well" responses, with PIs providing more "well" responses.

Analysis of 64 verbatim comments from CIs and PIs on other activities provided as part of HDR and PDR research training apart from the above found the most common activity to be providing direct support on research activities (e.g. through access to facilities and systems) which made up 29 per cent of comments. The next most common activity was administration of students (recruitment, probation, submission of theses) which made up 24 per cent of responses. Other activities mentioned were providing professional development opportunities (19 per cent) and managing relationships between HDRs/ PDRs and other stakeholders (14 per cent).

Figure 5. ITRP support of research training delivery



In terms of specific benefits of the ITRP for supporting collaboration in research training, half of the respondents (comprising ROs, Dirs, Mgrs, CIs and PIs) felt that work experience for HDRs and PDRs was the greatest benefit, followed by networking opportunities (18 per cent) and aligning HDR and PDR training with industry outcomes (12 per cent).

In terms of issues encountered in the delivery of placements, the two most common issues reported were timing of placements, and recruitment of HDR students and PDRs (18 per cent each). Other common issues noted were the placement design (14 per cent), IP arrangements (8 per cent), distance of placements from home universities (7 per cent) and logistics of arranging placements (7 per cent).

Analysis of 108 comments from HDRs and PDRs on how the ARC can improve research training found that most common topic respondents discussed was the need for more and higher quality training opportunities through industry placements and skills development courses (43 per cent of comments) – this was particularly strong for HDRs, with 54 per cent of their comments addressing this topic. Other topics discussed included greater funding support (18 per cent) and improved communications between stakeholders (and between HDRs and PDRs from different Research Hubs and Training Centres), which made up 13 per cent of comments.

The most common topics in the 43 general feedback comments provided by Dirs, Mgrs, CIs and PIs on research training were access to training opportunities (18 per cent), alignment of training activities with industry needs (15 per cent), recruitment, logistics and timelines for placements (ten per cent each). Thirteen per cent of comments were generally positive remarks as compared to three percent generally negative remarks.

HDR and PDR respondents were also asked to provide general feedback on their experiences of research training through the ITRP. Among 73 comments, the most common type was general positive remarks, which made up 35 per cent of all comments (28 per cent of comments from PDRs and 41 per cent of comments from HDRs). This compared to 12 per cent of comments being generally negative in nature (14 per cent of comments from PDRs and 11 per cent of comments from HDRs). The remaining comments covered topics such as the process for completing placements as part of their engagement (14 per cent), research collaboration (nine per cent), and networking opportunities (nine per cent).

Interviews with Dirs were consistent with the above findings, with interviewees giving generally positive responses in terms of the delivery of training, with the alignment of student training with industry needs seen as a strong feature, and the development of capabilities in research methods, particularly for HDR students.

> *As a PhD training opportunity, I think it's fantastic – I think I'm confident that the people who graduate at the Centre will be able to find jobs in the industry or be in a position to think about doing something on their own. I think they'll be well qualified in that respect.*
>
> *- Training Centre Dir*

However, interviewees noted challenges in arranging and securing industry placements, as well as recruiting high quality local students in a competitive market.

Number of Higher Degree by Research (HDR) students and post-doctoral researchers (PDR) involved

Dirs and Mgrs of Research Hubs reported that an average of five HDR placements (median of two) and four PDR placements (median of two) have been undertaken in their Research Hubs.

For Training Centres, the average number of HDR placements reported was six (median of five) and the average number of PDR placements was two (median of two).

In terms of the 176 HDRs and 97 PDRs who reported that they have completed or are completing placements, they reported an average placement length of ten months (median three months – this suggests a minority of placements are quite long in duration). By comparison, Dirs and Mgrs of Research Hubs and Training Centres reported an average placement length of three months (median of two months) for HDRs, and four months for PDRs (median of two months).

Dirs and Mgrs reported that on average two non-university organisations are involved in placements (median of one organisation).

In terms of outcomes for HDRs and PDRs who had completed their training as part of the ITRP, 41 per cent were in some form of study (63 per cent of HDR students and ten per cent of PDRs), and 68 per cent were working full time (57 per cent of HDR students and 84 per

cent of PDRs). A further nine per cent were working part time, and 16 per cent were not employed (six per cent were not employed and not looking for work).

For those respondents who are in work, 79 per cent are employed by universities, 15 per cent by industry, and six per cent by government.

HDR students and PDRs roles in ITRP projects including types of industry placements

HDRs and PDRs reported playing a variety of roles in ITRP projects (Figure 6), including leading projects and subprojects as part of their engagement. Respondents from Training Centres were more likely to report having led research projects or supervised training as compared to respondents from Research Hubs.

Figure 6. HDR and PDR roles

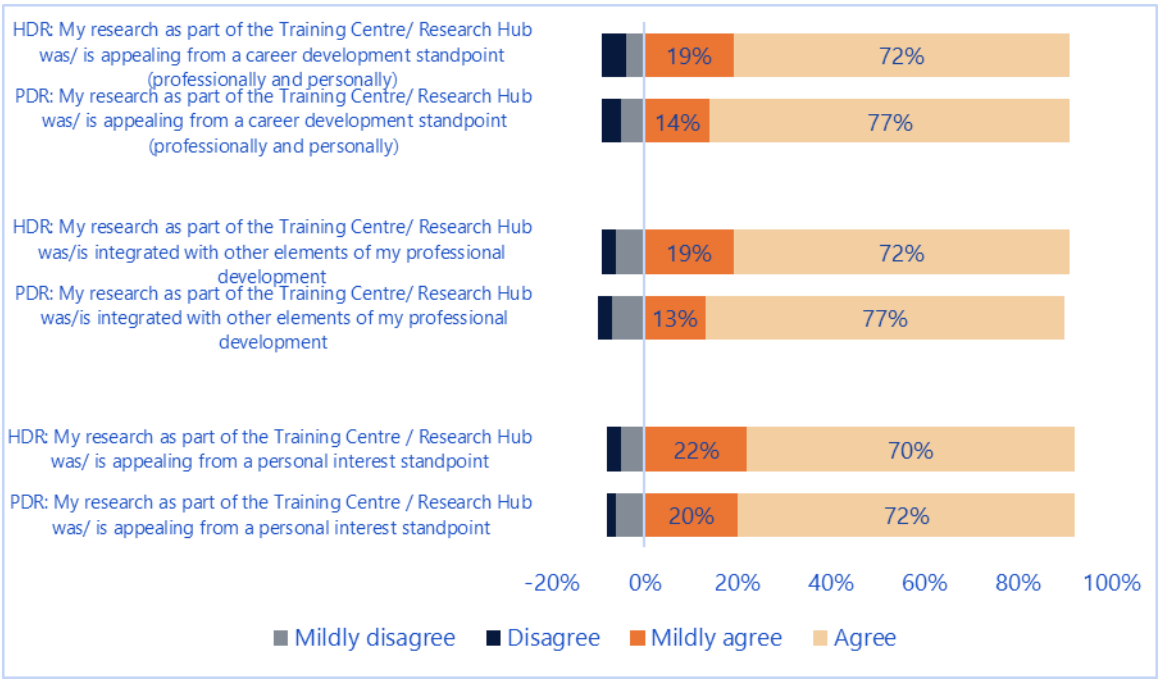
Forty five per cent of HDRs and PDRs who provided open text responses on other activities as part of their industry placements reported undertaking some form of research or experimental activities, with 22 per cent involved in conferences and workshops, nine per cent completing site visits with industry, and eight per cent involved in business management activities relating to Research Hubs and Training Centres.

Reasons HDR students and PDRs choose to be involved in the ITRP (as opposed to other opportunities for industry experience)

This evaluation question was not directly addressed through the survey; however, HDRs and PDRs were asked about their views on their involvement in Training Centres and Research

Hubs. Both groups had similar views with respect to career development, professional development and personal interest all rating strongly (Figure 7). PDRs tended to agree more strongly than HDRs in relation to all areas.

Figure 7. HDR and PDR views on involvement



Nature of partner organisations involvement in the development of and design of ITRP placements

Eighty-five per cent of university survey respondents (ROs, Dirs and CIs) reported that partner organisations were involved in the development and design of research training placements (for Training Centres this was 92 per cent as compared to 79 per cent for Research Hubs). However, only 64 per cent of PIs reported that they or their organisations were involved, which is a statistically significant difference. This may represent different perceptions on what involvement meant for each group, or the different roles that PIs have had in Research Hubs and Training Centres.

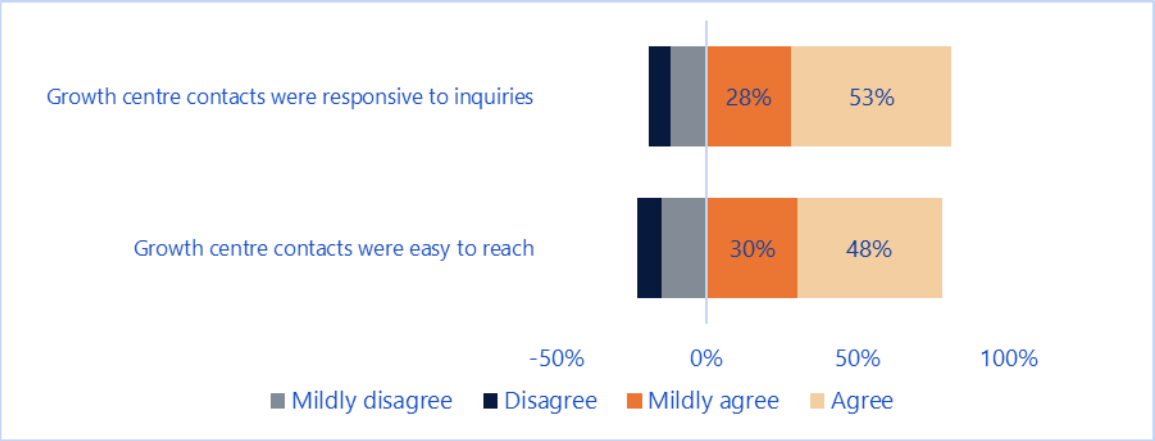
3.3 Engagement with Industry Growth Centres (IGCs)

Effectiveness of engagement with Industry Growth Centres as part of ITRP processes

Analysis of 104 comments from ROs, Dirs, Mgrs, CIs and PIs found that the most benefit seen from engagement with the IGCs was in the area of identifying and enabling partnerships (28 per cent), followed by support in the design and application process (22 per cent), and the provision of market advice (21 per cent). Notably, 12 per cent of comments were negative about their experiences with IGCs, saying that they were not at all beneficial.

Most ROs, Dirs, Mgrs, CIs and PIs found the IGCs both easy to reach and responsive to enquiries (Figure 8). By group, Mgrs reported the most positive results on these dimensions, while ROs were more negative. There did not appear to be a pattern of variation in responses based on program round. Note that although IGCs were only introduced in 2015, responses were received from participants from all ITRP rounds.

Figure 8. IGC ease of contact and responsiveness



Analysis of 38 verbatim comments from ROs, Dirs, Mgrs, CIs and PIs presented more mixed views on engagement, with 31 per cent of comments being generally negative around engagement with IGCs as compared to generally positive comments which made up 26 per cent. Some respondents indicated that they were unclear about the role of IGCs within the ITRP:

> *How this is meant to work could be better articulated. It feels like a gatekeeper role, but it could be a much better engagement. I'm a big supporter of the Growth Centres but my engagement outside of ITRP has been the good engagement with them.*
>
> - *Research Hub CI*

In terms of issues relating to engagement with IGCs, the primary issue noted in survey comments was difficulty in contacting and engaging with IGCs (36 per cent):

> *Not responsive to telephone calls – no answer. Not responsive to emails – no reply.*
>
> *- RO respondent*

Eighty-four verbatim responses were provided on the main issues faced when engaging with IGCs, with 36 per cent of responses discussing issues with contacting IGCs (timeliness, ease of contact). A further 16 per cent discussed issues around the alignment of IGCs with the ITRP, and the quality of their links with industry (12 per cent).

Interviews with Research Hubs and Training Centre Dirs and Mgrs also corroborated these viewpoints, expressing uncertainty around aspects of the role of IGCs and the need for clarity, particularly in relation to their role at the application stage. Dirs and Mgrs felt unclear as to whether IGCs are advocates (i.e. their support can influence the success of applications) or involved in assessing applications (making decisions).

Interviews with DIIS found that engagements with the IGCs are seen as a way of reinforcing the industry focus of the program:

> *…it's actually solving an industry problem, it's not maybe a solution in search of a problem. [For the ITRP] it's research led so we are trying to bring that industry focus.*
>
> *- DIIS representative*

The IGC survey found that for the most part, engagement was driven by universities reaching out to IGCs either through ROs or from CIs; only one IGC reported being proactive in promoting the ITRP to universities and industry.

IGCs also felt that this engagement was meaningful, with three of the five IGCs feeling that engagement was "very meaningful", one respondent stating that engagement was "meaningful", and the remaining respondent stating that engagement was "somewhat meaningful". Respondents stated that the ability to provide feedback and have discussions with applicants not only benefited the quality of applications but improved knowledge sharing, collaboration and understanding of industry needs and directions.

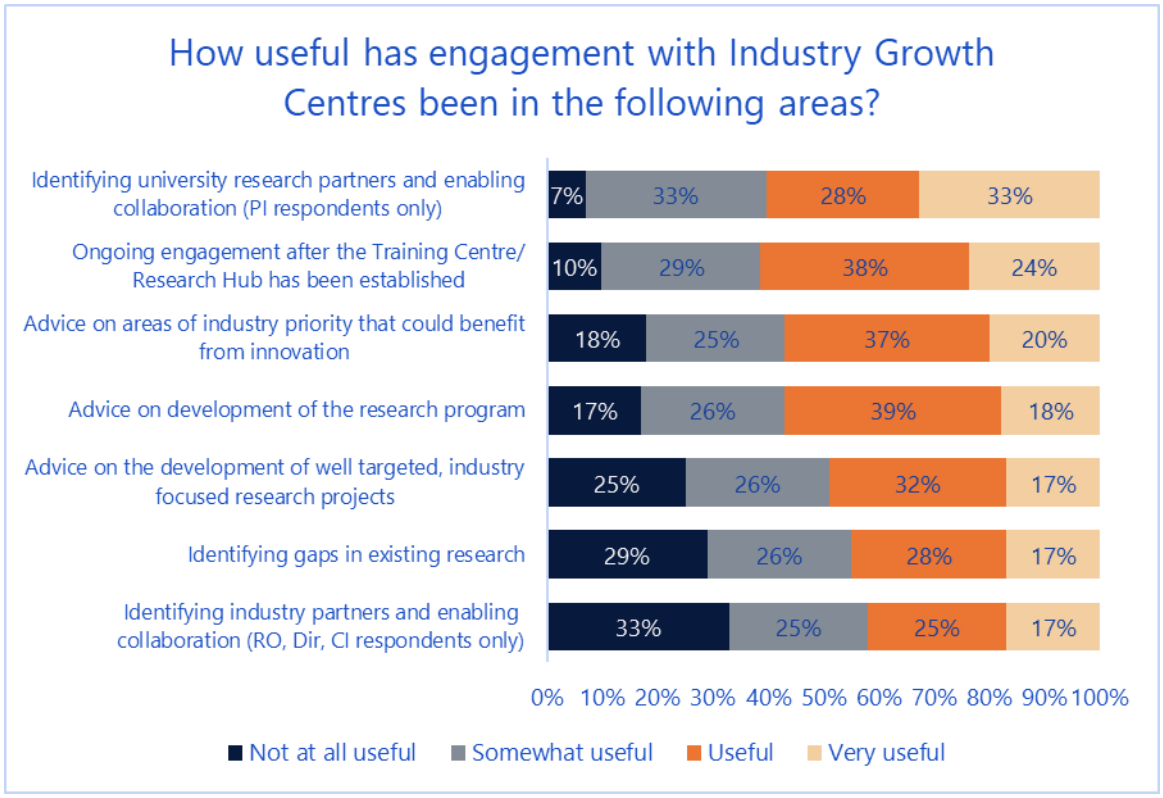
IGCs were unanimous in their view that interaction between the ITRP and IGCs supports both programs in achieving their objectives, predominantly by enabling collaboration between industry and academia and through knowledge transfer.

Perceived usefulness and value of the advice provided by Growth Centres to universities, researchers and partner organisations

ROs, Dirs, CIs and PIs had mixed views on the usefulness of advice provided by IGCs (Figure 9). The most positive area was identifying university research partners, (about which only PI

respondents were asked) and the most negative area was the ability of IGCs to identify industry partners and enable collaboration (about which only ROs, Dirs and CIs were asked). For questions answered by ROs, Dirs, CIs and PIs ongoing engagement after establishment received the most positive responses, while identifying gaps in existing research produced the least positive responses. By respondent group, PIs tended to be more positive in their views of IGCs, while ROs were less positive.

Figure 9. Usefulness of IGC engagement



Interviewees from the ARC and DIIS felt that engagement with IGCs are a way of gaining valuable advice about industry—particularly insights on market trends, emerging technologies and on ARC and government priorities. Dirs from Research Hubs and Training Centres valued the advice on research projects while a few talked about adapting/ restructuring projects as a result of advice given.

All five IGC survey participants reported providing advice on industry priorities and on identifying industry partners. Four IGCs also reported providing advice on identifying research gaps and on developing research programs to applicants. Other advice was also provided by IGCs on commercialisation, mentoring, and communications plans for Research Hubs and Training Centres.

Three of the five IGCs felt that applicants were very receptive to the advice they provided, with one respondent feeling that applicants were "receptive", and the remaining respondent feeling that applicants were "somewhat receptive". Respondents noted that this receptiveness

was evidenced through a willingness by applicants to incorporate advice into applications, and in some cases, meet further with the IGC to gain a better understanding. The respondent who stated that in their experience applicants were only "somewhat receptive" noted a mixed reception by applicants:

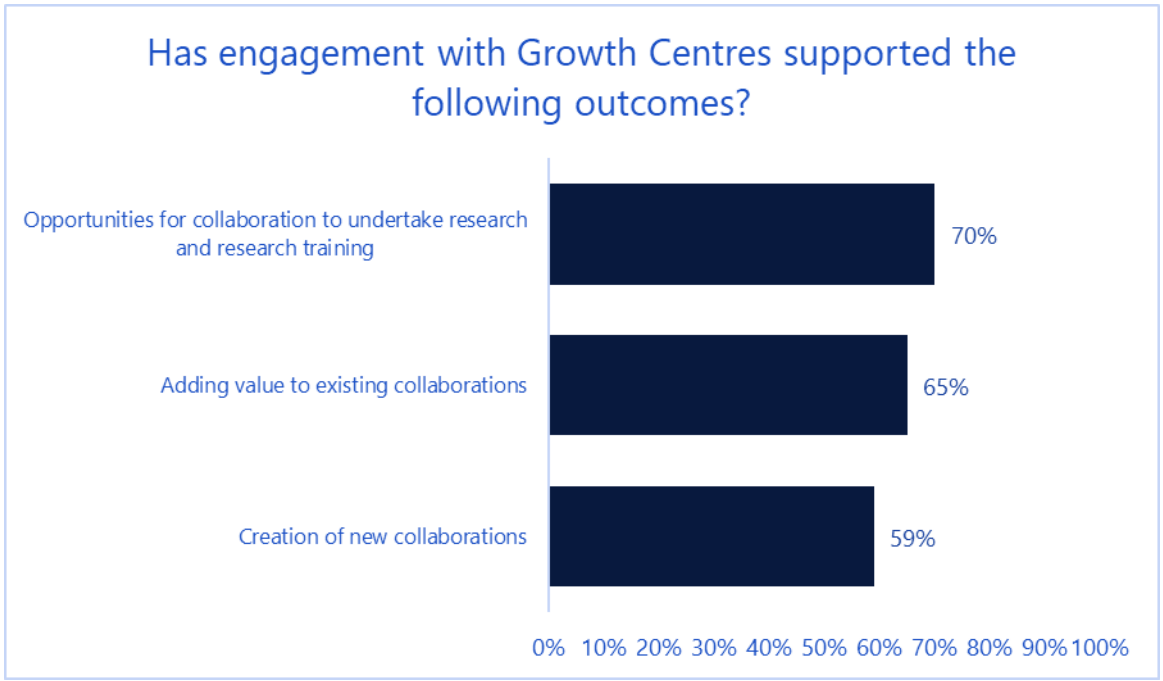
> *Some Training Centres see input as a dilution of the idea and without ongoing value, others do not.*
>
> *- IGC representative*

This questioning of the value of IGCs was also articulated by a small number of Research Hub Dirs (though these interviewees were involved with Research Hubs that existed prior to the formation of IGCs, so they had not had direct interaction with the IGCs).

Extent Industry Growth Centres support opportunities for collaboration that may not otherwise occur, or that add to existing collaborations and nature of value-add

The majority of respondents (comprising ROs, Dirs, Mgrs, CIs and PIs) together felt that engagement with IGCs had supported collaborations in a number of ways (Figure 10). ROs tended to be most positive, while Dirs and CIs were less positive.

Figure 10. IGC support for collaborations



Comments on the benefits of IGCs supported this result. Among 118 comments provided, 27 per cent addressed the role of the IGC in promoting partnerships. A further 21 per cent

discussed the role of the IGCs in providing market advice, and 15 per cent described their involvement in the design process as beneficial.

Dir and Mgr interviewees from Research Hubs and Training Centres were also positive in this regard. As examples, one Training Centre Dir reported that an IGC identified potential small to medium enterprise (SME) partners for a research project, which they would not have otherwise known about or collaborated with. Two Research Hub Dirs said that IGC presentations about successful collaborative partnerships between the research and industry sector highlighted opportunities for other partnerships.

Three of the five IGCs surveyed agreed that their involvement in the ITRP supports opportunities for collaboration that may not otherwise occur. One IGC noted that this collaboration also improves efficiency through the reduction of duplicated activities:

> *We have been able to point researchers towards new industry partners as well as towards research collaborators. We are not keen to see research duplicated across Australia.*
>
> *- IGC representative*

Views on the extent Industry Growth Centres support innovative research and the development of well targeted, industry focused research and research training

There was limited information from interviews with Dirs and Mgrs in relation to this area, though most interviewees assumed this was the case. Only two of the five IGCs surveyed though felt that their engagement supports innovative research collaboration and the development of well-targeted projects. In relation to this, one IGC noted mixed results depending on the mindset of the applicant:

> *Some bids come with partners and defined goals that are relatively set. Other bids are looking for support in defining the goals.*
>
> *- IGC representative*

From the perspective of the ARC, there was a concern that the limited priorities of the IGCs limited the scope of the ITRP:

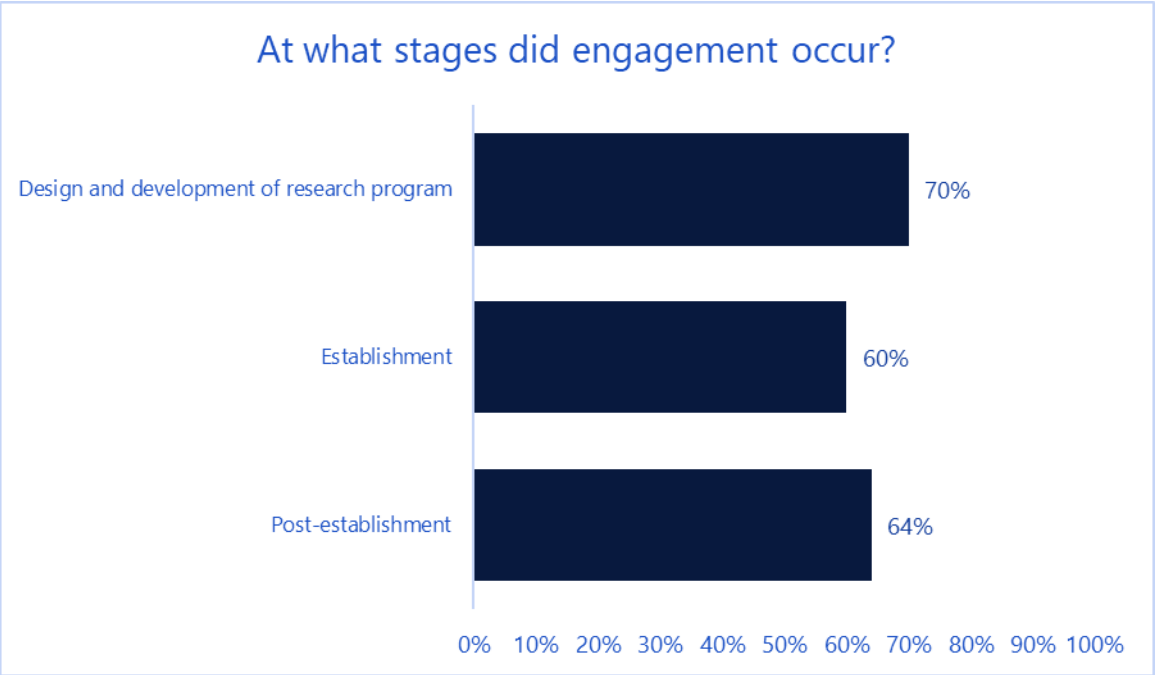
> *[The ARC should] consider whether the ITRP should be based on just the Growth Centres or whether it should be based upon whatever priority list the ARC itself actually builds up because by default that leaves us somewhat beholden to another organisation for what the priorities are… is the intent just to support the other agency in which case the other agency may as well run the program or is it there to support academics and could it be engaging with industry in which case their priority should inform our priorities but perhaps not be our priorities to give us a little bit of flexibility.*

- ARC representative

Engagement with Industry Growth Centres beyond the proposal stage

The majority of RO, Dir, Mgr, CI and PI respondents to the survey reported engagement with IGCs at all stages of the Training Centre and Research Hub life-cycle (Figure 11). The strongest levels of engagement were reported by ROs. Respondents from Training Centres reported more engagement occurring than those from Research Hubs.

Figure 11. IGC engagement



On average, Dirs, Mgrs, CIs and PIs engaged with a single IGC, while ROs reported engagement with an average of three IGCs, reflecting their broader role in overseeing research at universities, which may have multiple Research Hubs and Training Centres.

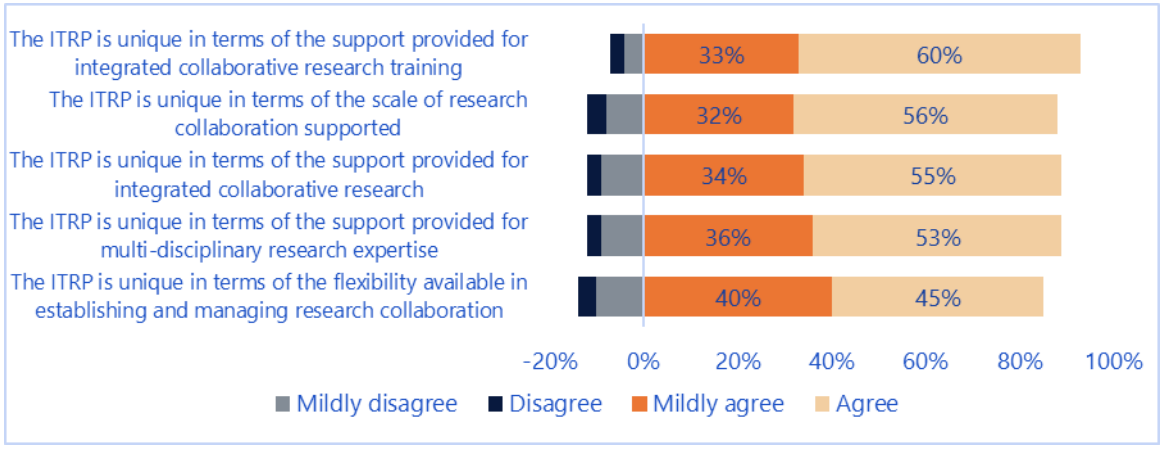
All five IGCs that participated reported that they had been engaged during the proposal phase. Only two reported involvement during the establishment phase, and four reported involvement after establishment.

3.4 ITRP fit with other Australian Government programs that support industry focused research and innovation

Effectiveness of fit with Growth Centres, CRC, CRC-P and the Global Innovation Linkages Program

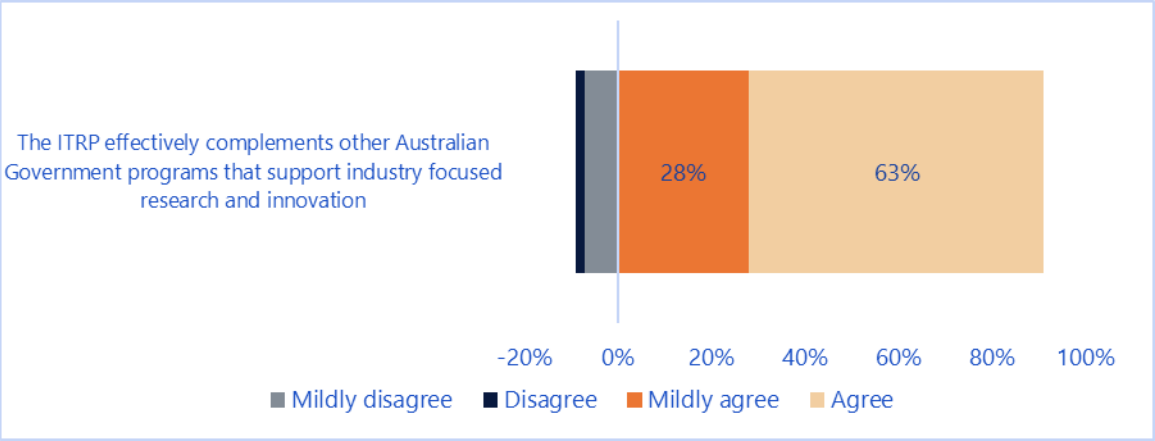
ROs, Dirs, CIs and PIs were asked to rate the uniqueness of the ITRP on five dimensions as part of the survey (Figure 12). Across all dimensions, respondents generally agreed in their perception that the ITRP is unique, with the strongest response seen in support for collaborative research training, and the least strong response being in the area of flexibility for establishing and managing research collaboration. Among respondent groups, Dirs had the strongest agreement on all dimensions.

Figure 12. ITRP uniqueness



Sixty-three per cent of survey respondents agreed in their perception that the ITRP effectively complements other Australian Government programs, and a further 28 per cent mildly agreed with this statement (Figure 13). Again, Dirs agreed most strongly with this statement relative to other groups.

Figure 13. ITRP complementarity with other Australian Government programs



IGC survey respondents generally agreed in their perception that the ITRP effectively complements other Australian Government programs, though one respondent felt there was a lack of alignment with CRCs. Among the five IGC respondents, four agreed the ITRP was unique amongst government programs in providing support for integrated collaborative research training. Fewer agreed on its uniqueness in other areas.

Interviews with both ARC and DIIS representatives indicated that the ITRP is seen as a complement to other industry focused schemes:

> *We have the Linkage projects, which are smaller, then we go into our industrial transformation research programs, and then we've got our own ARC centres. They're sort of equivalent with the CRC. Because ours are initiated by academics they, in my mind, sit quite neatly against the CRCs and the industry-focused ones, which can often have industry as the administering body for the money.*
>
> *- ARC representative*

Reasons administering organisations and their partners seek support under the ITRP rather than other industry focused research schemes

Interviews with ROs and Dirs found that the primary reason for seeking support under the ITRP was that larger scale projects can be funded, compared with other industry funded research schemes:

> *What the Hub represented was … a conglomeration of a number of these ARC Linkages - in other words, a much more efficient way of trying to apply and then ultimately a more efficient way of trying to deliver a number of these ARC Linkages that have all been sort of brought together.*
>
> *- Research Hub Dir*

The larger scale also enables less pressure to seek large contributions from industry towards research projects:

> *There is not a big onus for us to get huge amounts of cash from industry because you cannot always find it, and if they have a huge amount of cash they [industry] tend to run their own project, which is a bit more confidential.*
>
> - *Training Centre Dir*

Other reasons for seeking support highlighted by ROs and Dirs include:

- a focus on student training
- extended placements in industry
- broad scope
- early stage research focus
- alignment with university goals for developing industry ready degrees

CRC-Ps and ARC Linkage Projects were most commonly mentioned by ROs and Dirs as other schemes they had applied for. Interviewees felt that by comparison, ITRP is more early stage research focussed than CRC-Ps. Linkage Projects grants were seen as smaller and less connected with industry. The broader CRC program was also mentioned as a comparison, with the primary differentiator being that ITRPs were university-led and less complex to establish and run.

Interviews with the ARC also found that the early stage research focus was an attractor for applicants, as well as the ability to work with SMEs:

> *[The ITRP] allows them to do a lot more lower development level work, taking the idea to see if we can actually make something work out of it and the fact that it doesn't have as much industry fund matching requirements enables them to work with a lot smaller companies.*
>
> *- ARC representative*

The role of the Industrial Transformation Priorities (which match the areas of focus for the Industry Growth Centres) in focusing applications on key industry priority areas

ROs and Dirs felt that the Industrial Transformation Priorities effectively focus applications on key industry priority areas. There was consensus that the priorities reflect many of Australia's transformational areas of need. Some identified perceived gaps but there was no common view of what those gaps were. Two interviewees made the point that while aligning IGC priorities with ITRP is useful, IGC priority areas are relatively narrow and do not cover the whole economy.

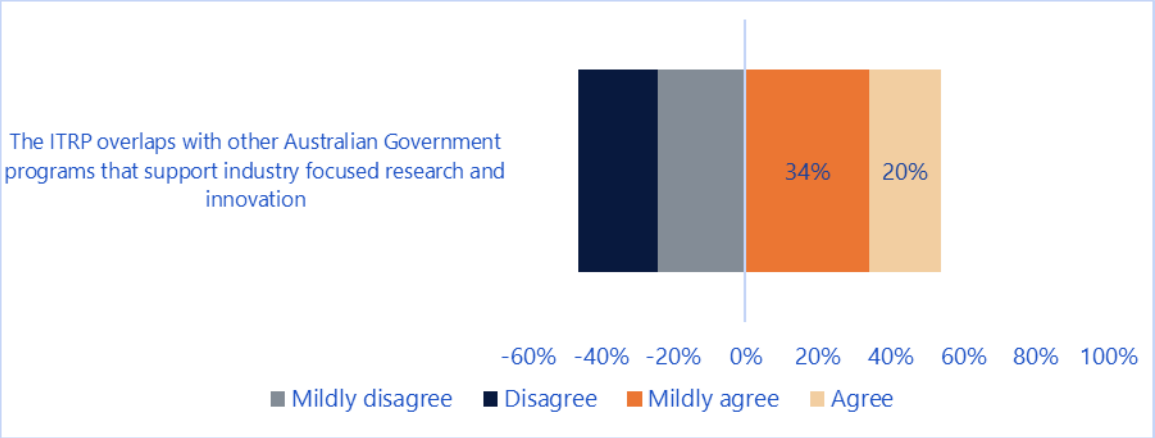
From the perspective of the IGCs, there was general agreement that the Industrial Transformation Priorities focus applications on priority areas, though one IGC felt that their area had not received as much focus from the program:

> *I don't think there has been a fair spread of ITRP funding across the six priority sectors. Is this because of a clear interest in particular sectors for the ITRP assessors and decision-makers or a variable quality of applications across sectors? It would be good to know either way so that we can address for our sector.*
>
> *- IGC representative*

Potential overlaps or inconsistencies between the ITRP and other industry focused research schemes

Survey respondents from ROs, Dirs, CIs and PIs were asked if they felt that the ITRP overlaps with other programs that support industry focused research and innovation (Figure 14). Fifty-four per cent of respondents agreed to some extent with this statement, suggesting that there is a perception of overlap with other programs.

Figure 14. ITRP overlap



ROs, Dirs and Mgrs were more inclined to view the ITRP as having a niche and complementary place in relation to other programs in terms of scale and focus. The unique elements of the ITRP were listed by interviewees as:

- offering student training placements in industry settings
- a focus on more fundamental/ basic research. One Research Hub respondent commented that ITRP has the reputation of attracting the best scientists and doing the best research.
- broader research and industry collaborations compared to Linkage Projects and better supports commercialisation of the research results, and
- intensive partnerships and greater opportunities for multi-disciplinary research.

Three of the five IGC survey respondents felt that the ITRP overlaps with other programs, particularly the CRCs and CRC-Ps where these have an industry focus.

Interviews with DIIS indicated that there was little perception of overlap with other programs; one ARC interviewee indicated that in their view the Global Innovation Linkages appeared to be very similar in scope (with the exception of the requirements around international partners).

3.5 Process implementation and advice to stakeholders

The effectiveness and efficiency of ITRP implementation processes and satisfaction with the associated advice provided by the ARC to ITRP applicants and other stakeholders

Overall, responses to interviews and the survey indicated that for most stakeholders the ITRP process is considered both effective and efficient. The major issues raised were around the timeframes for preparation of applications, the amount of information required for applications (especially from industry partners), and issues relating to negotiating and establishing collaborations with partners. Advice provided by the ARC has been received largely positively by stakeholders. These topics are covered in further detail in the below sections.

Regarding the establishment of collaborations, ROs, Dirs and Mgrs reported a few issues from their experiences. The predominant issue related to getting partnership agreements in place once the application was approved. Respondents found it a slow process to get letters of intent from industry signed, with one respondent saying that it can take 12 months (the expectation is six months). Some of the specific challenges encountered were around negotiating finances, IP arrangements, commercialisation arrangements, and the need to sign certification, which was considered to be duplicative.

The grant funding structure was also seen as an impediment to establishing collaborations, particularly the five-year timeframe for funding commitment, and the Research Hub requirement for 75 per cent of funding to be supplied by partners once an employee threshold was reached.

A perceived lack of awareness of the program by industry was also noted in the interviews, which respondents felt was impacting the understanding of partners around the program and how they can be involved.

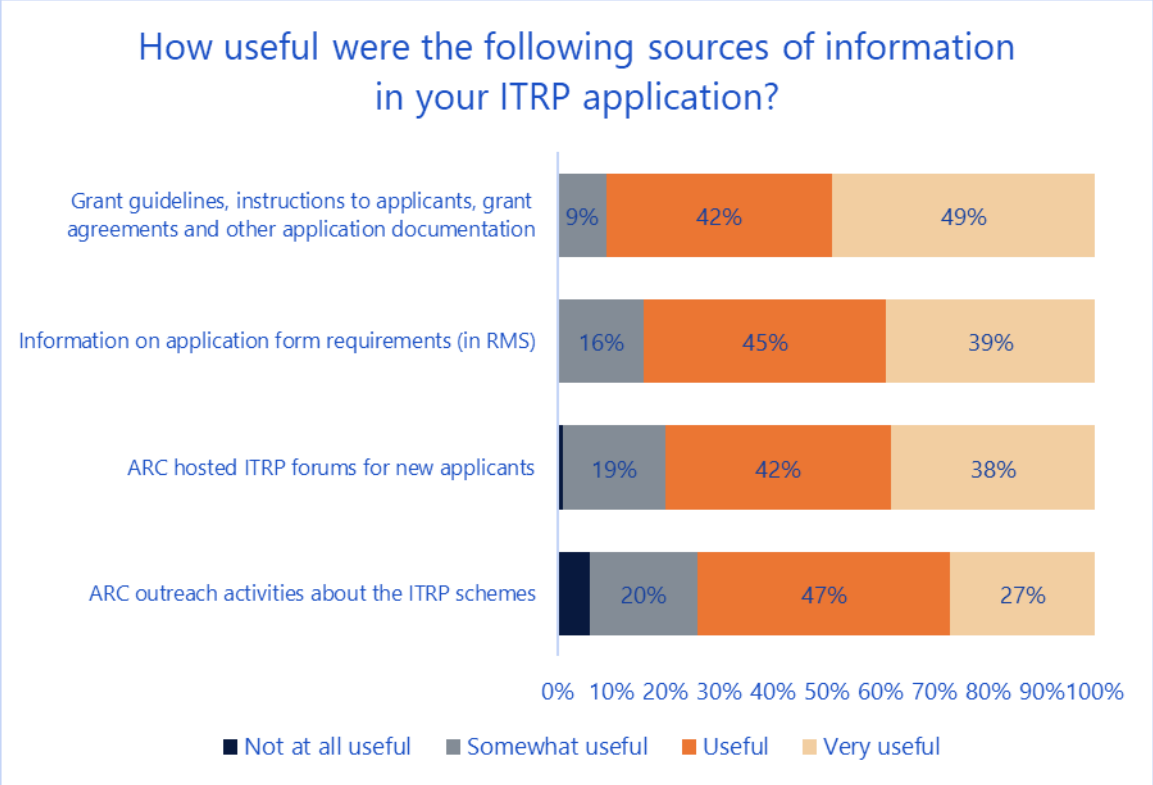
> *…because the ITRH wants to engage with the small-medium enterprises, they are where you probably don't have that awareness very high and the opportunities that might come with that to lead to those industry academia collaborations.*
>
> *- Research Hub Dir*

This indicates that a potential opportunity exists for the program to be promoted to industry.

Effectiveness and efficiency of application and assessment processes

In terms of ARC advice in the application process, respondents to the survey (ROs, Dirs and CIs) were generally positive about the usefulness of ARC information (Figure 15). Respondents felt that guidelines and application form requirements were most useful, while there are opportunities for improvement in outreach activities. Between respondent groups, CIs found forums and outreach activities to be less useful, while ROs found application forms and guidelines to be less useful as compared to other groups.

Figure 15. Usefulness of ARC information (application)

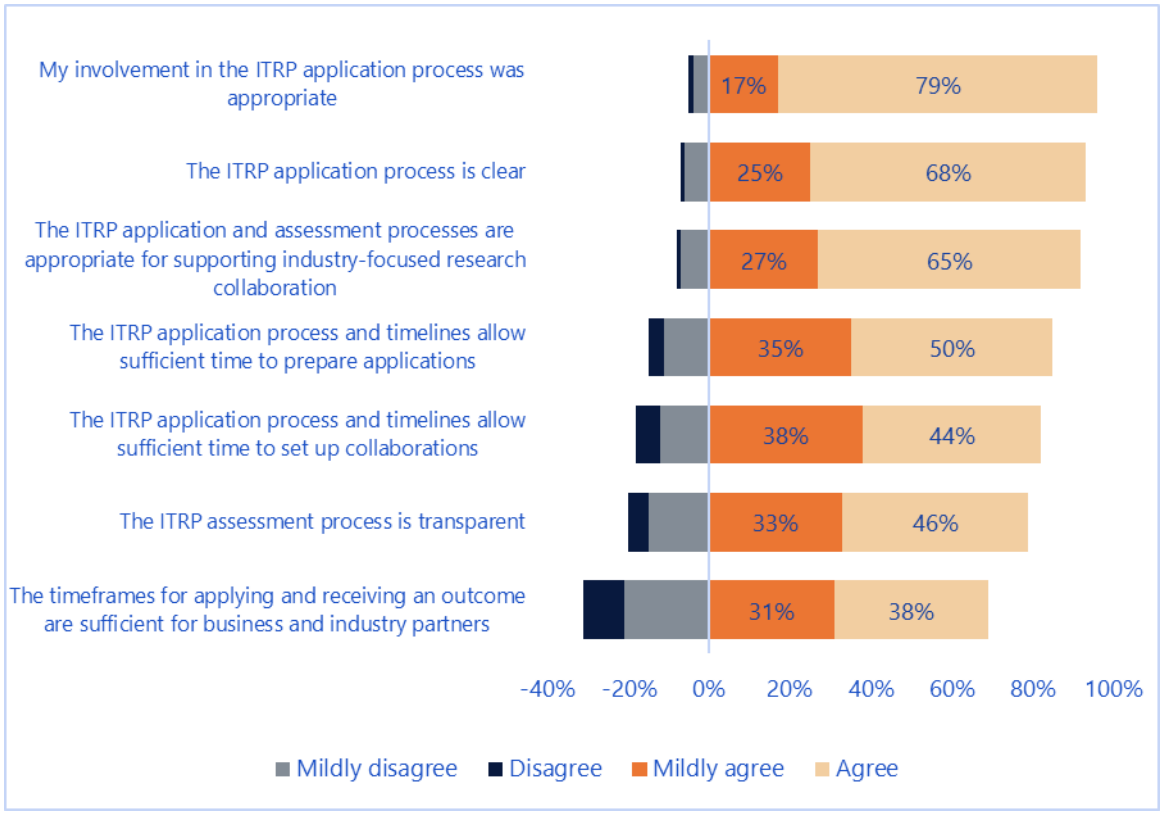


Respondents to the survey (ROs, Dirs, CIs and PIs) were asked about their views in relation to the application and assessment process (Figure 16). Respondents felt that their participation was appropriate and that the process was clear. However, there were less positive results in relation to timelines for the application process, as well as the transparency of the process. Broken down by group Dirs were the most positive across all areas. ROs were least in agreement with other groups around the appropriateness of timelines, being less positive.

Dir and RO respondents added that the size of the applications was a challenge (both to prepare, and for Dirs that had been involved in the assessment process, the size made it

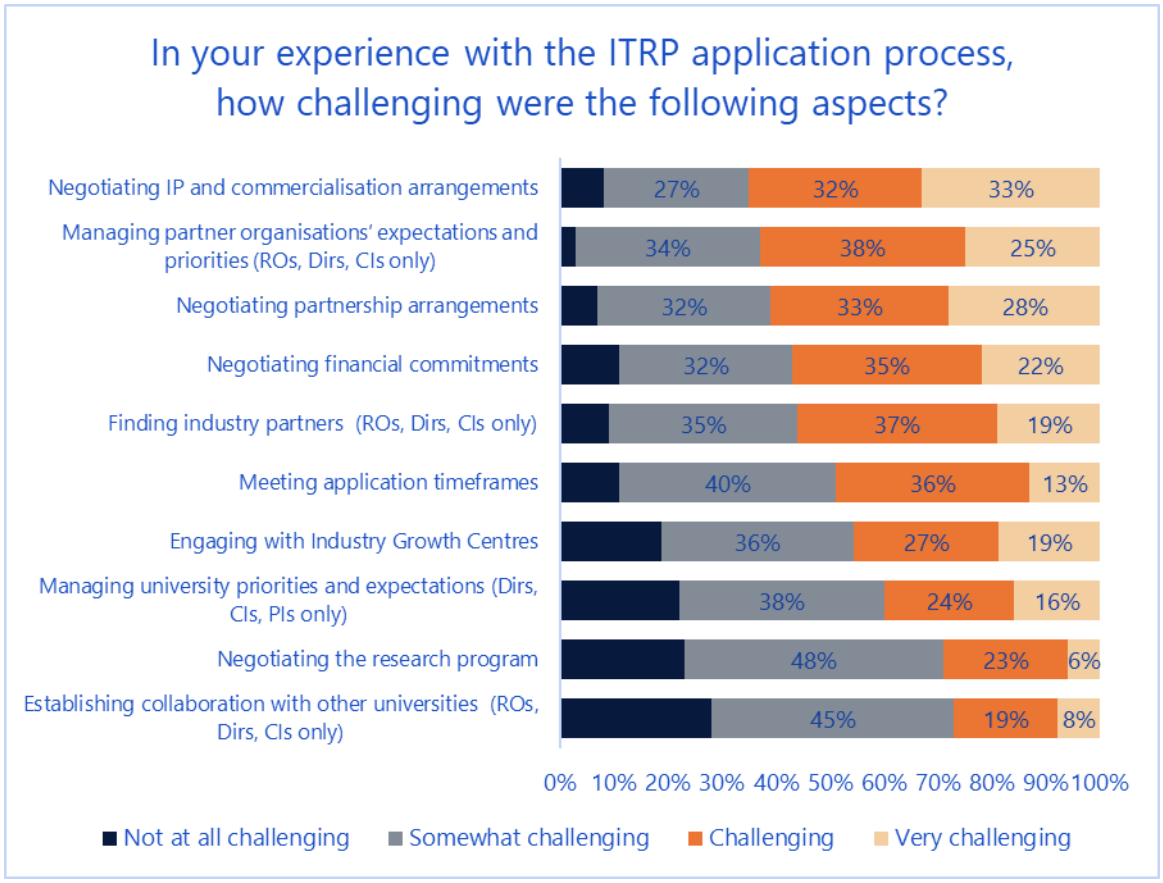
difficult to efficiently review applications). Timeframes were also raised as an issue, with respondents noting that they had a short lead time, and that the closure date for applications comes at a busy period for research institutions. One respondent suggested that an Expression of Interest process followed by a more detailed assessment process may reduce the administrative burden and allow them to better manage timeframes.

Figure 16. ITRP application and assessment processes



ROs, Dirs, CIs and PIs were also asked about challenges in the application process (Figure 17). Negotiating IP and commercialisation arrangements was reported as the largest challenge, followed by managing partner organisations' expectations (PIs were not asked this question). In terms of least challenging factors, these were establishing collaboration with other universities (PIs were not asked this question) and negotiating the research program. By group, PIs generally found the process less challenging as compared to other groups, particularly for negotiations.

Figure 17. Challenges in the application process



Of 81 comments provided by ROs, Dirs, and CIs on other significant issues in the application process, 25 per cent related to difficulties with the timelines for applications and the time required to prepare the application, a further 15 per cent related to achieving financial commitment from partners to being involved in the program, and a further 14 per cent related to managing relationships with partner organisations and getting them to work together (comments on this topic came primarily from CIs).

In terms of key learnings from the application process, analysis of 169 comments from ROs, Dirs and CIs found that the biggest learning was to begin as early as possible in developing the program and establishing partnerships (34 per cent of comments). A further 28 per cent stressed the importance of establishing and managing partnerships, and 14 per cent of comments discussed the value of building engagement across the collaboration.

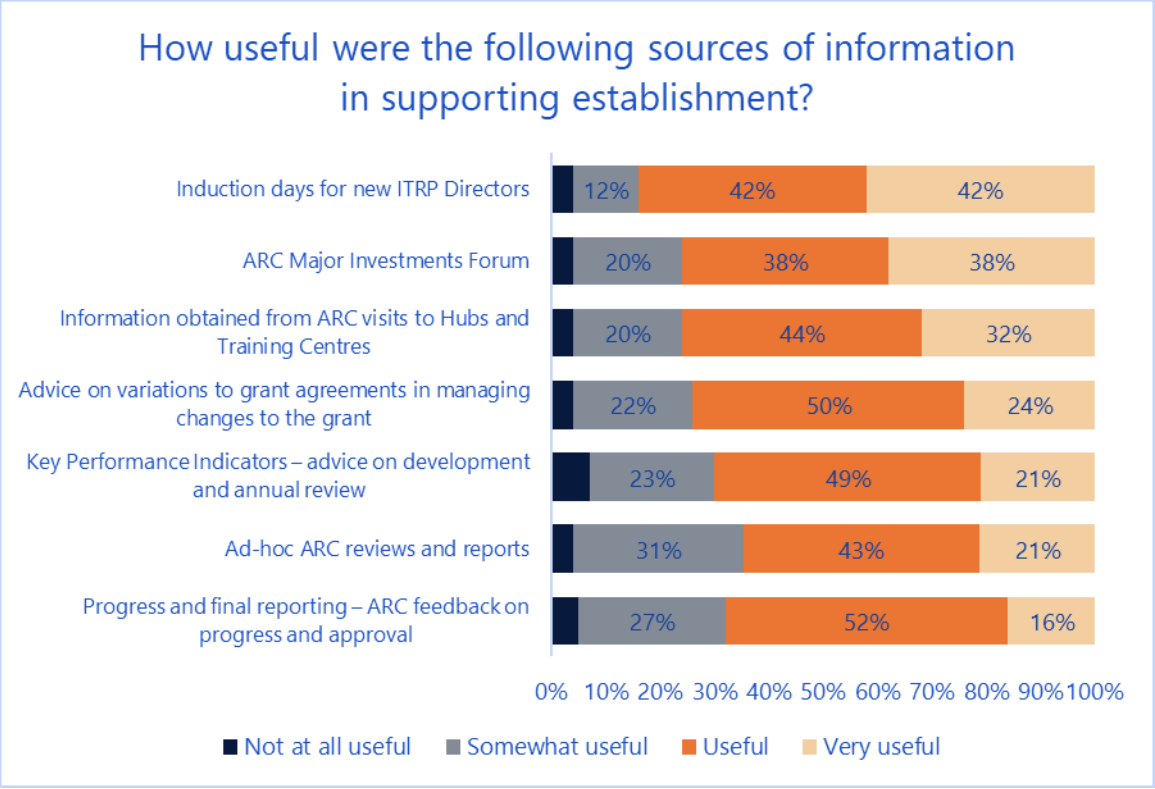
Ninety-one general feedback comments relating to the application and assessment process included an emphasis on timelines (21 per cent), and suggestions for improvement around the assessment process (20 per cent) and the application process (15 per cent). General positive comments about the process accounted for a further 10 per cent, and general negative comments accounted for 4 per cent.

Effectiveness and efficiency of processes and associated advice on project implementation issues such as establishment, contracts, recruitment, intellectual property and commercialisation arrangements

Respondents to the survey (ROs, Dirs, Mgrs and CIs) were generally positive about the usefulness of ARC information and advice (Figure 18)[2]. Respondents felt that induction days and the Major Investments Forum were most useful, while there may be opportunities for improvement in progress reporting and ad-hoc reviews. Between respondent groups, Dirs tended to find activities more useful as compared to other groups; however, many CIs chose not to respond to these questions, suggesting that they had not interacted with these sources of information throughout their engagement.

Dirs reported finding the yearly meeting with other Dirs useful for sharing experiences. However, they also felt that KPIs were less useful as they were not descriptive enough.

Figure 18. Usefulness of ARC information (establishment and post establishment)

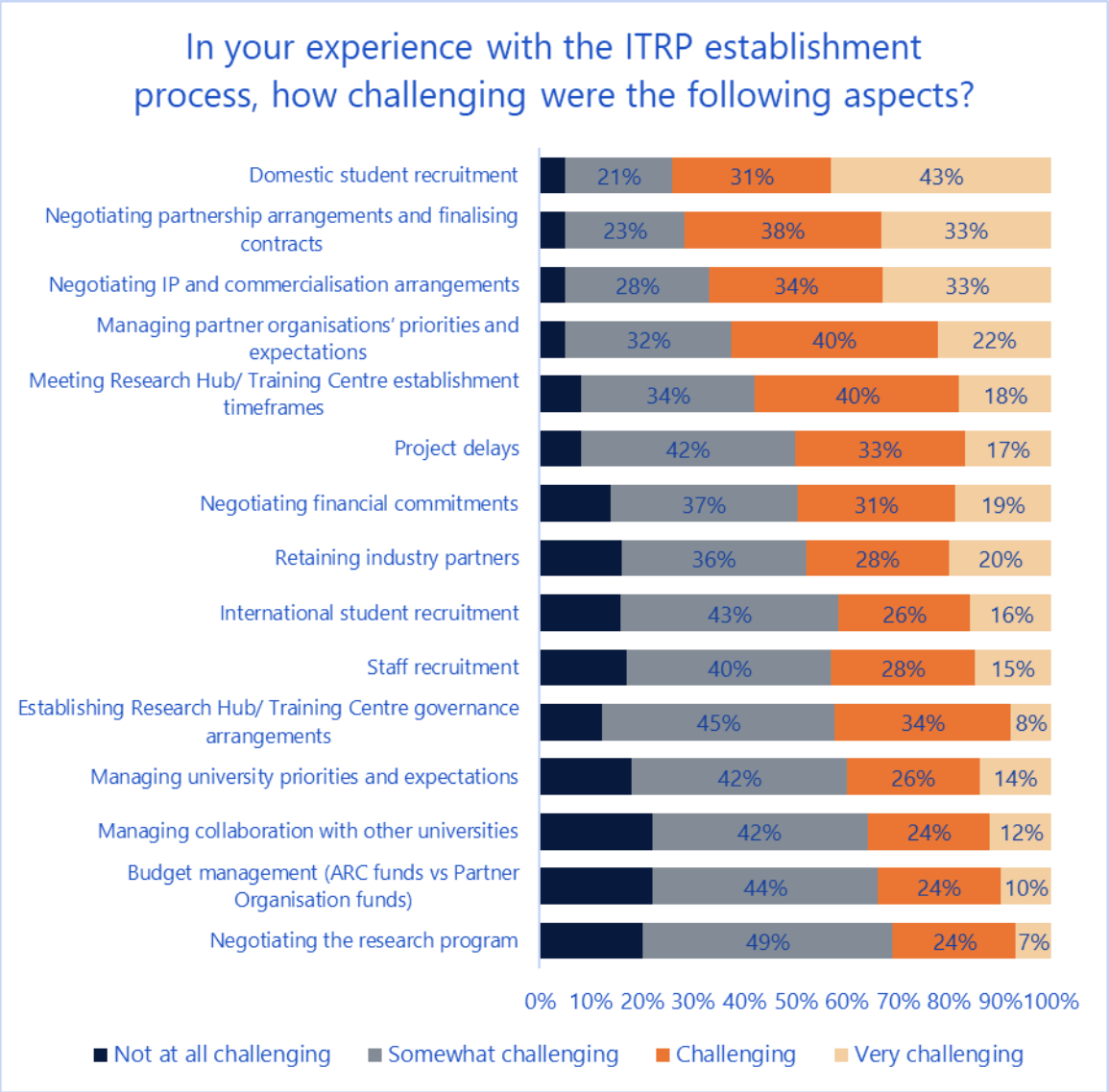


ROs, Dirs, Mgrs, CIs and PIs were also asked about challenges in the establishment process (Figure 19). Domestic student recruitment was reported as the largest challenge, followed by negotiating partnership arrangements and IP arrangements. In terms of least challenging

[2] The question language was: "How useful were the following ARC sources of information and advice in supporting the establishment of your [Hub/Centre]" – while there was a prefacing statement that stated that questions related to the establishment and post-establishment phases, it is possible that respondents limited their views to the role of information and advice in the establishment phase only.

factors, these were managing collaboration with other universities, budget management and negotiating the research program. By group, Mgrs and PIs generally reported the process to be less challenging than other groups.

Figure 19. Challenges in the establishment process



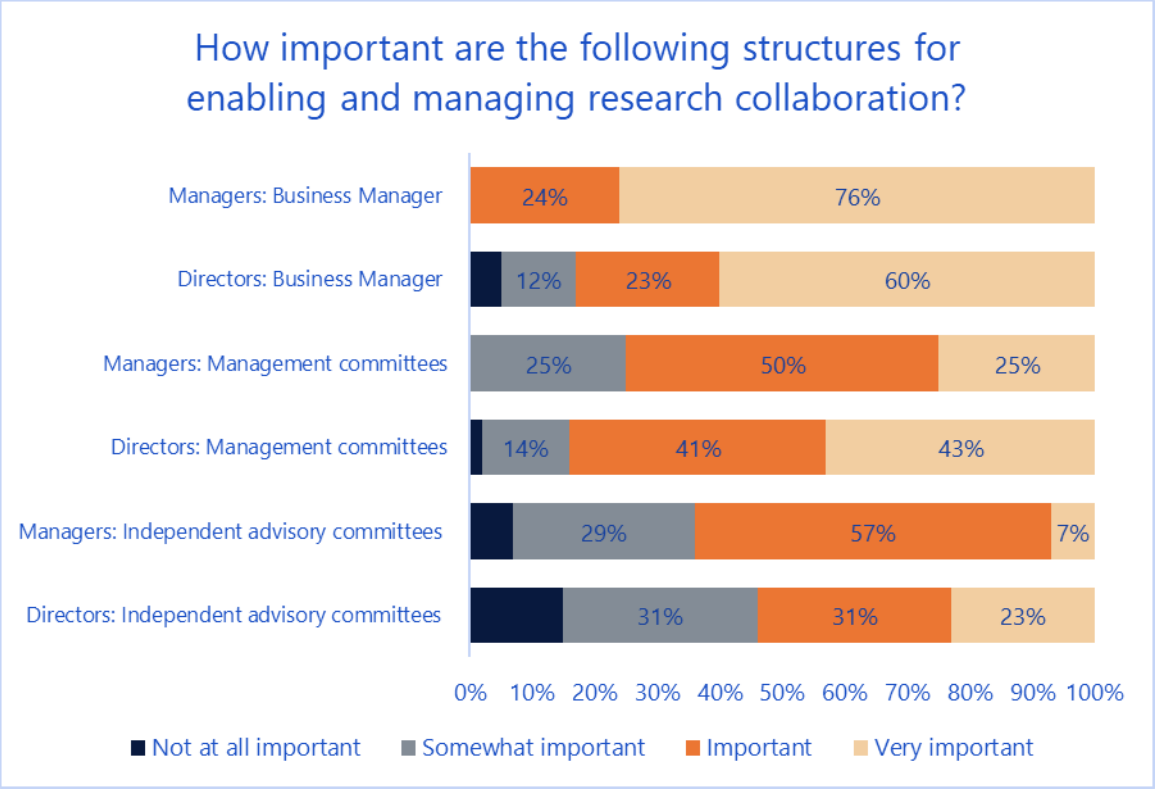
Of 99 comments provided on other significant issues in the establishment process, 18 per cent related to difficulties with managing agreements, 13 per cent related to HDR and PDR recruitment and management, and a further ten per cent related to dealing with changes in industry trends and the business environment.

In terms of key learnings from the establishment process, analysis of 190 comments from ROs, Dirs, Mgrs and Chief and PIs found that the biggest learning was to maintain good communications across stakeholders (26 per cent of comments). A further 22 per cent stressed the importance of cultivating partnerships (and within this, having a diversity of

partnerships). Ten per cent of comments discussed the importance of a good governance model and a strong management team.

Dirs and Mgrs were asked about the importance of particular governance structures for enabling and managing research collaboration (Figure 20). Note that Research Hubs and Training Centres may not have all these structures in place. For those that responded for each type of structure, business manager was seen as the most important role, followed by management committees and independent advisory committees. Mgrs considered that all of the governance structures were more important as compared to Dirs.

Figure 20. Importance of governance structures (Dirs and Mgrs)



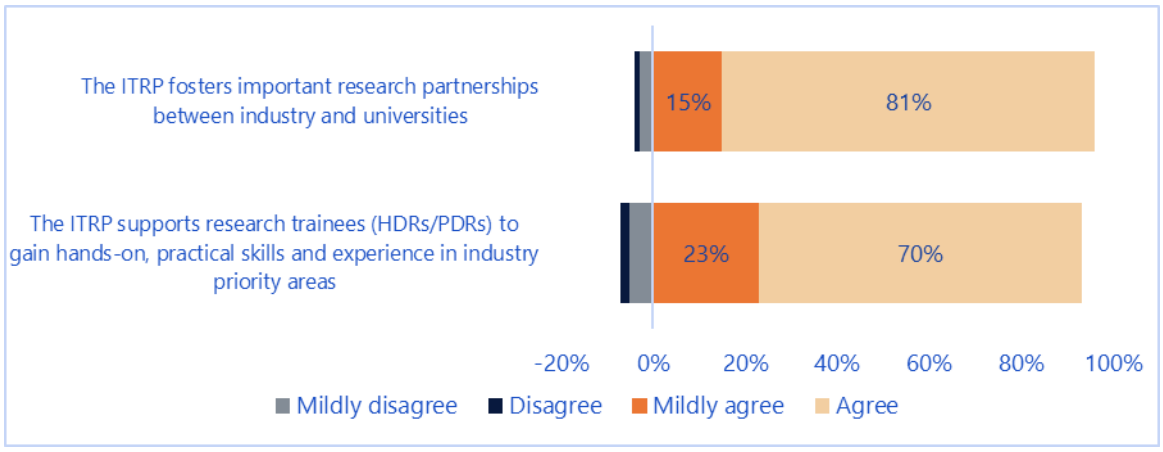
Other important governance arrangements identified in 25 comments from Dirs and Mgrs were executive meetings (17 per cent), research committees and general committees (13 per cent each), student committees (nine per cent), and industry agreements (nine per cent).

Forty-eight general feedback comments relating to the establishment process discussed difficulties in applying guidelines (13 per cent), the value of collaborations (11 per cent), and the role of individual people in the process (nine per cent). Fifteen per cent were general positive comments and nine per cent were general negative comments.

3.6 Overall objectives

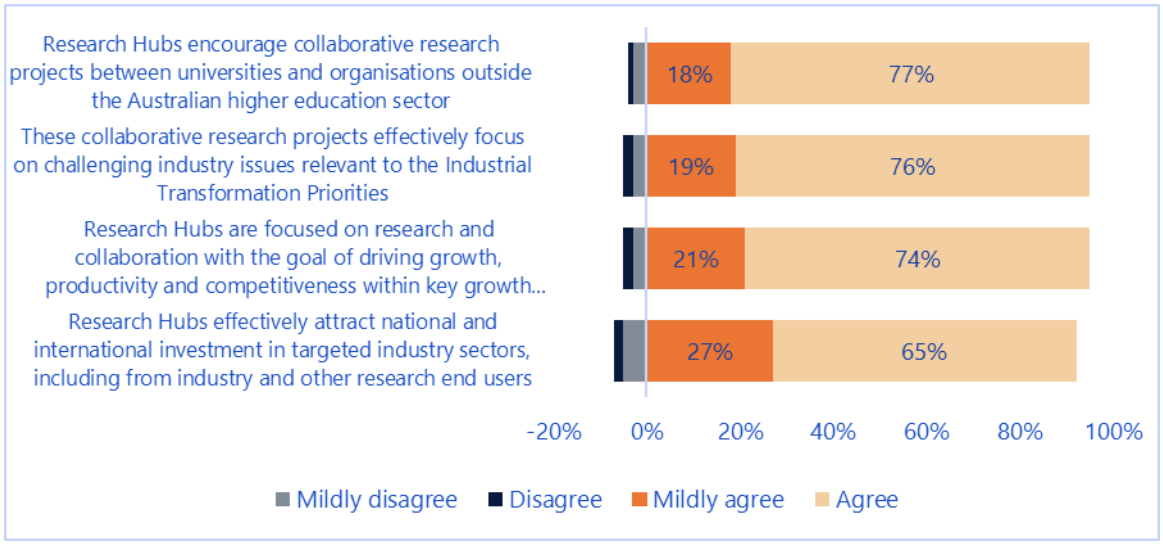
All respondents to the survey were asked about their views on the effectiveness of the ITRP in meeting its objectives (Figure 21) and, depending on their experience, the effectiveness of Research Hubs (Figure 22) and Training Centres (Figure 23) in meeting their objectives. In general, respondents agreed that the ITRP both fosters important research partnerships and supports research trainees to gain skills in industry priority areas.

Figure 21. ITRP objectives (General)



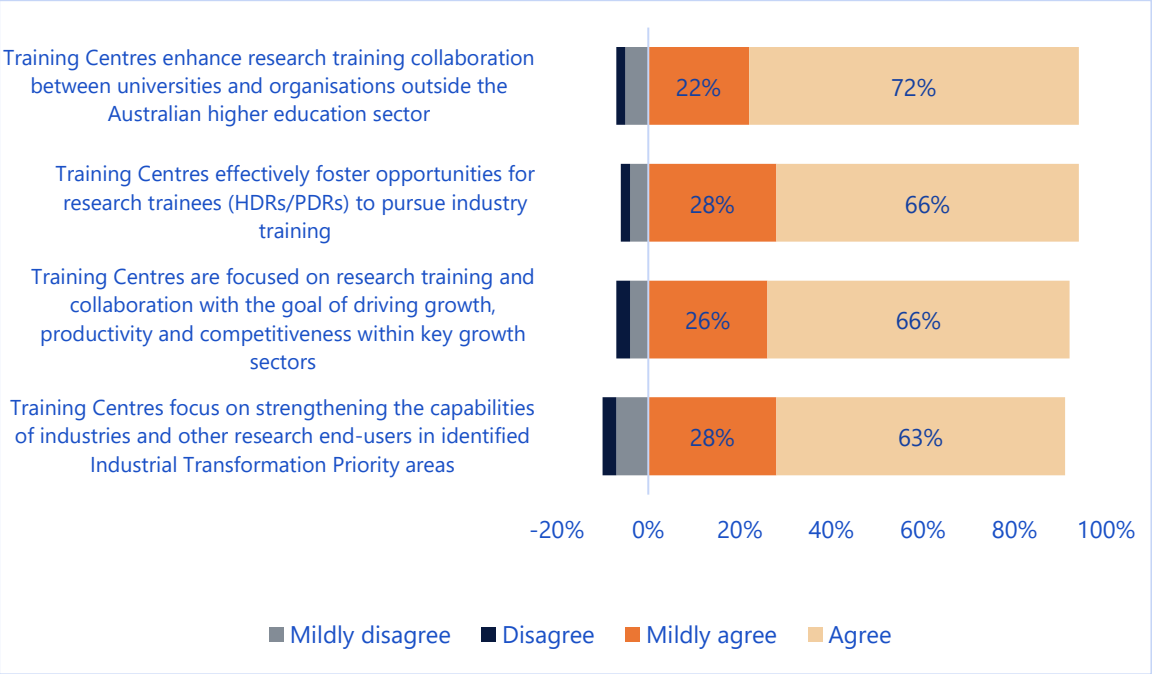
Respondents generally agreed that Research Hubs' objectives are being achieved, though there was less agreement in relation to their ability to attract investment in targeted industry sectors.

Figure 22. ITRP objectives (Research Hubs)



Respondents also generally agreed that Training Centres' objectives being achieved, with the strongest agreement seen in enhancing research training collaboration.

Figure 23. ITRP objectives (Training Centres)



In terms of encouraging and supporting industry focused collaborative research and research training, IGCs were unanimously positive in terms of their support for the ITRP:

> *The program provides an avenue for collaboration between research organisations (as the engines of innovation) and industry (the commercialisation vehicle). This interaction and collaboration is critical for better understanding of expectations and relevant knowledge exchange between industry and academia, providing an effective path for the commercialisation of new products or services to transform industry.*
>
> *- IGC representative*

3.7 General feedback

Dirs, Mgrs and ROs were asked to provide suggestions on ways the ARC can assist Research Hubs and Training Centres in the future. Across the 59 comments provided, funding changes (primarily increasing the size and length of funding) was the most common topic (24 per cent), followed by suggestions for improved communications and reporting processes (20 per cent). Feedback from IGCs on areas of improvement included:

- stronger communications and knowledge sharing plans
- having ITRPs based in industry with a free flow of academics/researchers
- specific funding/rounds for each priority sector
- support awareness that IGC engagement can occur after the grant has been awarded
- requiring local business school input on applications, in relation to likely demand for the ITRP outcomes and commercial pathway options.

Survey respondents were also asked to provide general feedback on the program. A broad sentiment analysis of 199 comments received found that around 60 per cent were positive in tone, with 31 per cent neutral in tone and nine per cent being negative. Further topical analysis of these comments found that the three most common topics of discussion (aside from simple positive or negative statements about the program) were:

- a desire to see greater monitoring and evaluation of Research Hubs and Training Centres (9 per cent)
- changes to the funding structure for the program – this included the size of funding as well as ensuring an appropriate balance in the distribution of funding between activities and partners (8 per cent)
- and changes to the timeframes for application and assessment (8 per cent).

Other notable topics raised by particular stakeholder groups included improving access to and timing of placements (HDRs) and increasing the timeframes for application preparation (ROs).

Interviews with ARC representatives indicated that there was a need to ensure that in the application process there is an understanding by reviewers of the capability and experience of proposed Dirs in running similar types of programs (as opposed to research projects):

> *… in many ways [the ITRP is] almost a training for you to run a bigger centre like the Centres of Excellence or the CRC's but at a slightly smaller scale ipso facto should we actually be doing more assessment than just your research ability, because we're actually looking at your ability to run an organisation. I'm not sure you can read that off [the application] or perhaps the selection criteria aren't quite right … because you're not really asking them to write about that capability.*
>
> *- ARC representative*

Feedback from interviews with DIIS representatives focused on ensuring that researchers are aligning their work with industry and business needs, and on evaluating the outcomes of collaborations, particularly from a commercial standpoint.

Appendix 1. Technical summary

Survey

The survey was delivered between 6 February 2019 and 28 February 2019 to a distribution list of 2,177 stakeholders. Reminder emails were sent on a weekly basis and 24 hours prior to closure of the survey.

A total of 702 complete responses to the survey were received, representing a response rate of 32.3 per cent. This is higher than expected for surveys of this type (typically a response rate of 20 per cent would be normal) and exceeded initial predictions for expected total responses.

A further 302 partial responses were received which have not been included in the analysis or final data set. This represents a completion rate of 69.9 per cent for those who started the survey, indicating a high degree of uptake for a survey of this length.

Twenty-four members of the contact list opted out from receiving further communications about the survey, representing 1.1 per cent of the contact list. Analysis of this showed that these were predominantly PIs.

Figure 24 shows a breakdown of completed survey responses over time between launch and closure of the survey. Spikes in the number of responses correspond to the transmission of reminder emails. The lower spike relating to the final reminder indicates that the length of the survey in the field was optimal, and that few further responses would have been received had the survey remained in field longer.

Figure 24. Survey responses by day

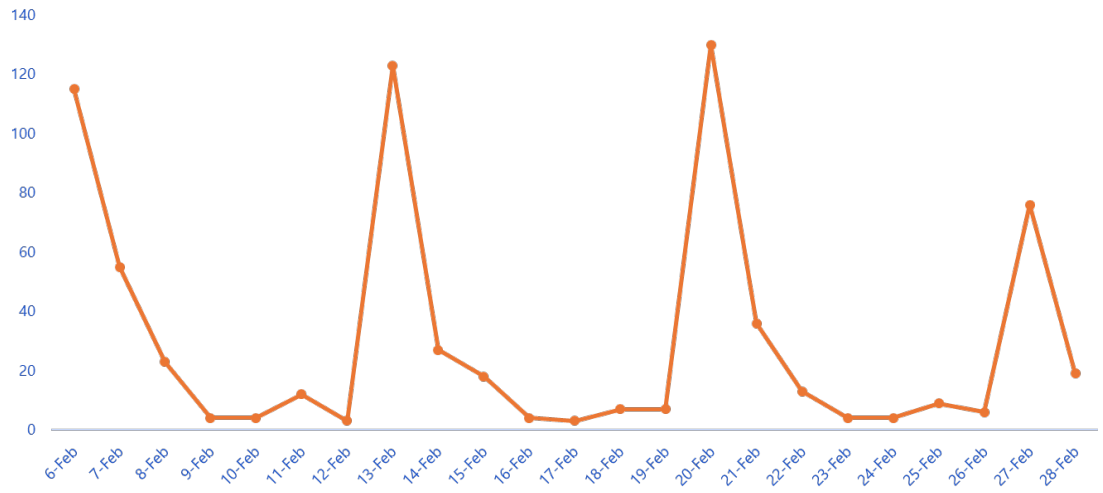


Figure 25 presents the response totals by group, and Figure 26 presents the response rate by respondent group. Response rates were calculated in comparison to the total contact list.

Figure 25. Responses by group

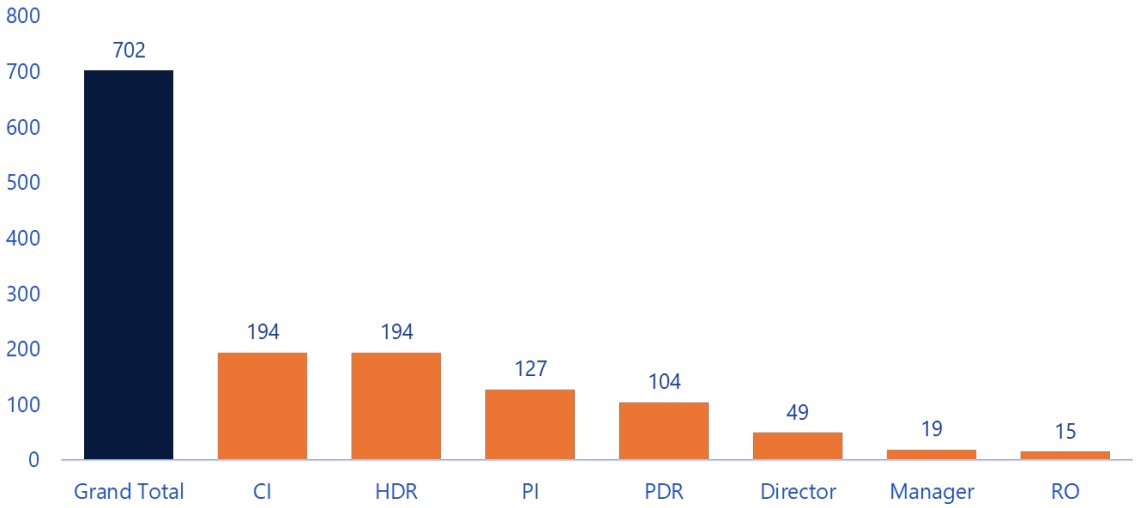


Figure 26. Response rate by group

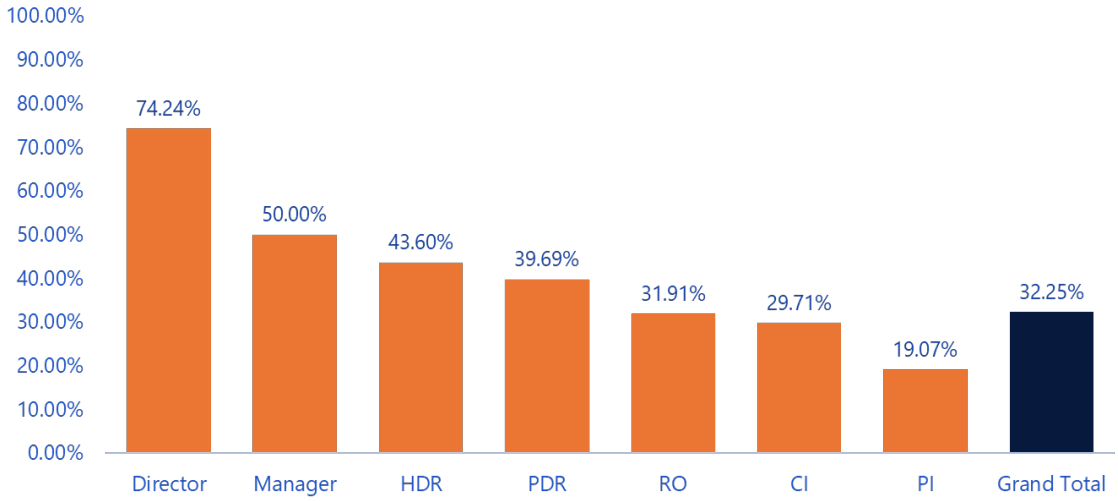


Table 1 and Table 2 present the breakdown of survey responses by response group (number and percentage respectively). Each of the groups provided a reasonable sample of the population, though ROs were slightly low. PIs had a low relative response rate, but this was offset by the large number of responses.

Table 1. Survey responses by response group (number)

Role	Complete	Partial	Not started
RO	15	8	24
Dirs	49	3	14
Mgr	19	9	10
CI	194	96	363
PI	127	80	459
PDR	104	37	121
HDR	194	68	183
Grand Total	**702**	**301**	**1174**

Table 2. Survey responses by response group (percentage)

Role	Complete	Partial	Not started
RO	31.91%	17.02%	51.06%
Dirs	74.24%	4.55%	21.21%
Mgr	50.00%	23.68%	26.32%
CI	29.71%	14.70%	55.59%
PI	19.07%	12.01%	68.92%
PDR	39.69%	14.12%	46.18%
HDR	43.60%	15.28%	41.12%
Grand Total	**32.25%**	**13.83%**	**53.93%**

IGC Survey

The IGC survey was delivered between 11 February 2019 and 28 February 2019 to six representatives from Industry Growth Centres. Reminder emails were sent one week after launch, followed by phone calls to remaining representatives. Five of the six representatives provided a response to the survey.

Appendix 2. Participant summary

Survey

Table 3. Survey responses by role and type

	RO	Research Hub	Training Centre	Total
RO	15			15
Dirs		22	27	49
Mgr		7	12	19
CI		101	93	194
PI		51	76	127
PDR		72	32	104
HDR		129	65	194
Grand Total	**15**	**382**	**305**	**702**

Table 4. Survey responses by role and round

	RO	2012 Round 1	2013 Round 1	2013 Round 2	2014 Round 1	2015 Round 1	2016 Round 1	2017 Round 1	2018 Round 1	Grand Total
RO	15									15
Dirs		1	4	6	7	7	5	8	11	49
Mgr				2	4	4	3	6		19
CI		7	17	14	42	20	13	45	36	194
PI		1	10	7	15	16	18	32	28	127
PDR		2	12	18	20	30	9	13		104
HDR		6	30	29	40	58	15	16		194
Grand Total	**15**	**17**	**73**	**76**	**128**	**135**	**63**	**120**	**75**	**702**

Table 5. Survey responses by type and round

	RO	2012 Round 1	2013 Round 1	2013 Round 2	2014 Round 1	2015 Round 1	2016 Round 1	2017 Round 1	2018 Round 1	Grand Total
RO	15									15
Research Hub		17	43	76	99	77		39	31	382
Training Centre			30		29	58	63	81	44	305
Grand Total	**15**	**17**	**73**	**76**	**128**	**135**	**63**	**120**	**75**	**702**

Interviews

Table 6. Interviews by role and type

	RO/ARC/DIIS	Research Hub	Training Centre	Total
RO	9			9
ARC	2			2
DIIS	2			2
Dir/Mgr		10	10	20
Grand Total	**13**	**10**	**10**	**33**

Table 7. Interviews by role and round

	RO/ARC/DIIS	2012 Round 1	2013 Round 1	2013 Round 2	2014 Round 1	2015 Round 1	2016 Round 1	2017 Round 1	2018 Round 1	Grand Total
RO	9									9
ARC	2									2
DIIS	2									2
Dir/Mgr		0	2	3	3	3	1	4	4	20
Grand Total	**13**	**0**	**2**	**3**	**3**	**3**	**1**	**4**	**4**	**33**

Table 8. Interviews by type and round

	RO/ARC/ DIIS	2012 Round 1	2013 Round 1	2013 Round 2	2014 Round 1	2015 Round 1	2016 Round 1	2017 Round 1	2018 Round 1	Grand Total
RO	9									9
ARC	2									2
DIIS	2									2
Research Hub		0	1	3	1	2	0	2	1	10
Training Centre		0	1	0	2	1	1	2	3	10
Grand Total	**13**	**0**	**2**	**3**	**3**	**3**	**1**	**4**	**4**	**33**

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