



**NATIONAL
INNOVATION &
SCIENCE AGENDA**



Australian Government
Australian Research Council
Department of Education and Training



**Engagement and Impact Assessment
Consultation Paper**

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1 Purpose of the document

The purpose of this document is to seek the views of stakeholders on the framework for developing the national assessment of the engagement and impact of university research. It provides an overview of the Government's policy rationale, parameters, and key issues regarding university research engagement and impact.

Feedback is invited from all stakeholders including the higher education research sector, industry and other end-users or beneficiaries of university research. In addition, the perspectives of industry and other end-users or beneficiaries of university research will be addressed through additional consultation mechanisms.

Stakeholders are asked to provide their views on the questions listed in this document. Please use the **feedback template** provided at **Appendix A**.

The **due date** for **stakeholder feedback** is **24 June 2016**.

2 The Government's policy commitment

In December 2015 as part of its *National Innovation and Science Agenda* (NISA) the Government announced the development of a national engagement and impact assessment which will examine how universities are translating their research into economic, social and other benefits and incentivise greater collaboration between universities, industry and other end-users of research.

The Australian Research Council (ARC) and the Department of Education and Training will develop and implement this assessment. It will run as a companion to Australia's national evaluation of university research quality—Excellence in Research for Australia (ERA).

3 The policy rationale and objectives

In 2015–16 the Australian Government is investing approximately \$3.5 billion in university research. Excellent research is fundamental to the generation of new ideas and future innovative capacity. ERA measures the quality of university research against world standards.¹ It has encouraged a heightened focus on research excellence in Australian universities and contributed to the continuing improvement in overall research quality in recent years. However, while Australia's research performs strongly on indicators of quality, it underperforms in measures of university and end-user collaboration for research.

This problem has become increasingly present in policy debates regarding Australian research and innovation and was identified in the *Review of Research Policy and Funding Arrangements* (2015). As the review noted "the diffusion of knowledge is just as important for innovation as the creation of knowledge" and improved research collaboration is essential for end-users and universities:

It benefits businesses and other end users through the access to ideas, knowledge, equipment and talent that they would not otherwise possess. This gives commercial advantage and boosts productivity.

The benefits to universities include new sources of income and new research opportunities. Better collaboration with end users can also produce a range of intangible benefits to researchers including enhanced reputation, insights to shape research agendas, opportunity to engage in real life problems, engagement with the broader community and improved employability for graduates.²

¹ Further information about ERA can be found at [ARC ERA 2015](#)

² Watt, I. 2015, *Report of the Review of Research Policy and Funding Arrangements*, pp 65-66.

Through NISA, the Government is working on ‘demand side’ policies to encourage greater collaboration between researchers, industry and end-users.³ In addition, recent consultations with university, industry and business stakeholders, through the research policy and funding review, have shown considerable support for an engagement and impact assessment as a way to help address these issues. Furthermore, experience in Australia and overseas has shown that measuring engagement and assessing impact creates the desired incentives for universities and researchers. For example, the UK’s Research Excellence Framework (REF) 2014 was a national assessment of research impact which not only demonstrated the real world value of research in British universities but also encouraged universities and researchers to focus more strongly on such benefits when planning and conducting their research. The Australian Academy of Technological Sciences and Engineering (ATSE) *Research Engagement for Australia* project showed how engagement between universities and end-users can be measured using existing government data collections. The lessons from these exercises, among others, will be outlined throughout this paper.

Existing systems of research evaluation (such as ERA regarding research quality) show that the transparent reporting of university performance will drive institutions to modify and improve their behaviour. It is anticipated that the assessment and reporting of a university’s performance in both research engagement and impact will lead to greater collaboration between universities and research end-users and incentivise improved performance in the translation and commercialisation of research. This in turn will deliver economic and social benefits and maximise the value of Australia’s public investment in research.

4 Parameters, guiding principles and timeframe

4.1 Parameters

The engagement and impact assessment will be developed within the following parameters:

- a retrospective (not prospective) assessment of research performance⁴
- the eligible universities will be institutions defined in Tables A and B of the *Higher Education Support Act 2003*—currently 42 universities
- all research disciplines involved
- accounts for different disciplinary practices and does not advantage one discipline over another
- seeks to minimise the data collection burden on participating institutions and
- is cost effective and makes use of the existing ARC systems to the greatest possible extent.

4.2 Model of assessment and guiding principles

The general model for the assessment that is being developed is for a:

- comprehensive engagement assessment of university research and
- impact assessment that exposes performance at institution and discipline level and the steps taken to achieve impact.⁵

The following ten principles will guide the development of the specific indicators of engagement and impact used in the assessment:

- **Robust and objective**—objective measures that meet a defined methodology that will reliably produce the same result, regardless of when and by whom the principles are applied.

³ For further information about the range of Australian Government initiatives supporting NISA see: [NISA website](#)

⁴ It is intended that, consistent with the ERA approach, the retrospective data collection is as up to date as possible.

⁵ This is potentially achievable with a relatively small number of case studies or exemplars compared to the recent REF exercise in the UK.

- **Internationally recognised**—while not all indicators will allow for direct international comparability, the indicators must be internationally recognised measures of research engagement and impact. Indicators must be sensitive to a range of research types, including research relevant to different audiences (e.g. practitioner focused, internationally relevant, nationally- and regionally-focused research).
- **Comparability across disciplines**—indicators will take into account disciplinary differences and be capable of identifying comparable levels of research engagement and impact.
- **Not disincentivise interdisciplinary and multidisciplinary research**—indicators will not disincentivise universities from pursuing interdisciplinary and multidisciplinary research engagements and impacts.
- **Research relevant**—indicators must be relevant to the research component of any discipline.
- **Repeatable and verifiable**—indicators must be repeatable and based on transparent and publicly available methodologies.
- **Time-bound**—indicators must be specific to a particular period of time as defined by the reference period.
- **Transparent**—all data submitted for evaluation against each indicator should be able to be made publicly available to ensure the transparency and integrity of the process and outcomes.
- **Behavioural impact**—indicators should drive responses in a desirable direction and not result in perverse unintended consequences. They should also limit the scope for special interest groups or individuals to manipulate the system to their advantage.
- **Adaptable**—recognising that the measurement of engagement and assessment of impact over time may require adjustment of indicators for subsequent exercises.

4.3 Timing

The following timeframe has been identified for the engagement and impact assessment:

- the framework, to be developed in 2016, including:
 - consultation with key government stakeholders and representatives from research end-users in the first half of 2016
 - public consultation, particularly targeting Australian universities and industry groups and other end-users by mid-2016
 - ongoing consultation with expert working groups throughout 2016 and 2017
- a pilot exercise to be conducted in the first half of 2017 and
- the first full data collection and assessment to take place in 2018 (based on to be determined reference periods) in conjunction with the next ERA round.

5 Key issues

5.1 Overview

In developing the framework for the assessment, feedback is being sought from stakeholders in the following broad areas: definitions and scope of assessment; key issues in undertaking the assessment; and what type of indicators will be used for assessing engagement and impact.

Each of these broad areas raise questions for stakeholder consideration. These questions are repeated under the relevant discussion areas below and in the feedback template at **Appendix A**. Stakeholders are asked to answer any of these questions they consider relevant, and are invited to provide any other general feedback.

Definitions and scope

1. *What definition of 'engagement' should be used for the purpose of assessment?*
2. *What definition of 'impact' should be used for the purpose of assessment?*
3. *How should the scope of the assessment be defined?*
4. *Would a selective approach using case studies or exemplars to assess impact provide benefits and incentives to universities?*
5. *If case studies or exemplars are used, should they focus on the outcomes of research or the steps taken by the institution to facilitate the outcomes?*
6. *What data is available to universities that could contribute to the engagement and impact assessment?*
 - i. *Should the destination of Higher Degree Research students be included in the scope of the assessment?*
 - ii. *Should other types of students be included or excluded from the scope of assessment (e.g. professional Masters level programmes, undergraduate students)?*

Key Issues

7. *What are the key challenges for assessing engagement and impact and how can these be addressed?*
8. *Is it worthwhile to seek to attribute specific impacts to specific research and, if so, how should impact be attributed (especially in regard to a possible methodology that uses case studies or exemplars)?*
9. *To what level of granularity and classification (e.g. ANZSRC Fields of Research) should measures be aggregated?*
10. *What timeframes should be considered for the engagement activities under assessment?*
11. *What timeframes should be considered for the impact activities under assessment?*
12. *How can the assessment balance the need to minimise reporting burden with robust requirements for data collection and verification?*
13. *What approaches or measures can be used to manage the disciplinary differences in research engagement and impact?*
14. *What measures or approaches to evaluation used for the assessment can appropriately account for interdisciplinary and multidisciplinary engagement and impact?*

Types of engagement and impact indicators

15. *What types of engagement indicators should be used?*
16. *What types of impact indicators should be used?*

5.2 Definition and scope

The assessment is intended to measure engagement *and* assess impact. The definitions adopted will guide the types of measures used, the relative importance of measures in determining ratings, and the types of ratings which will be valuable. The definitions will be fundamental to the outcomes of the assessment for the sector.

5.2.1 Definition of engagement and impact

Typically, research impact has come to be defined as the effect of research beyond academia. For example, the UK REF which is the primary example of a national assessment of university research impact defined impact as:

an effect on, change, benefit to the economy, society, culture, public policy or services, health, the environment or quality of life beyond academia.⁶

Similarly, the ARC in conjunction with a number of Australia's publicly funded research organisations adopted the following definition in its *Research Impact Principles and Framework* (2012):

Research impact is the demonstrable contribution that research makes to the economy, society, culture, national security, public policy or services, health, the environment, or quality of life, beyond contributions to academia.⁷

A recent trial by ATSE which developed metrics from ERA data chose to focus on research engagement only. ATSE's reasoning was that research impact focussed on the late stages of the research process and that there are significant methodological difficulties in assessing impact (many of these will be noted later in this paper). Therefore, ATSE defined engagement as:

the interaction between researchers and research organisations and their larger communities/industries for the mutually beneficial exchange of knowledge, understanding and resources in a context of partnership and reciprocity.⁸

The OECD has recently focussed on knowledge transfer and commercialisation in a review of trends and strategies for commercialising public research:

Knowledge transfer and commercialisation of public research refer in a broader sense to the multiple ways in which knowledge from universities and public research institutions (PRIs) can be exploited by firms and researchers themselves so as to generate economic and social value and industrial development.⁹

It is important to recognise that the definitions of research engagement and impact adopted may advantage some disciplines over others. Some definitions may also lead to more emphasis being placed on short-term, applied, or business focussed research over the longer-term public benefits derived from more fundamental research. The intangible nature of some social benefits of research makes quantification difficult and so qualitative approaches based on narrative explanations of the benefits of research projects have been advocated to overcome this. Although more easily measured, overemphasis on industry engagement and income measures on research can have long term negative implications. Narrow measures, if used in isolation, can drive researchers to maximise measures associated with short-term input measures at the expense of potential long-term economic and social benefits.

Consultation questions

- 1. What definition of 'engagement' should be used for the purpose of assessment?**
- 2. What definition of 'impact' should be used for the purpose of assessment?**

⁶ [REF Impact](#)

⁷ [ARC research impact principles and framework](#)

⁸ [ATSE research engagement for Australia report](#), page 7

⁹ OECD, 2013, *Commercialising Public Research: New Trends and Strategies*, OECD Publishing, p. 18. This report also notes "in recent years the term "knowledge exchange" has emerged, and is sometimes used in preference to "transfer". Terms such as "research mobilisation", "public engagement", "research utilisation", "valorisation activities" and "knowledge exploitation" have been used synonymously." p. 22.

5.2.2 Scope of assessment

The engagement and impact assessment will cover all research disciplines and include the 42 universities currently defined by the Table A and Table B provisions of the *Higher Education Support Act 2003*. Beyond this, consultation is being sought on the scope of the assessment in terms of its *coverage of research activity*.

Unlike a number of other research evaluation systems, ERA is a comprehensive evaluation of research activity, requiring universities to submit data on *all* of their research staff, research outputs, research income, and other indicators that are eligible for submission.¹⁰ As a result, ERA provides a complete view of the research performance in all Australian universities. It allows for the identification of areas of excellence as well as areas that require development or a shift of focus. The UK REF (and its predecessors) are selective assessments that require the nomination of the “best work” produced by staff. Similarly, the REF assessed “the impact of excellent research undertaken within each submitted unit ... [through] specific examples of impacts ... and by the submitted unit’s general approach to enabling impact from its research.”¹¹

As discussed below, there are a number of practical challenges to assessing impact, including the difficulties of identifying impacts beyond academia, the significant time delays between research and impact, and the cost of data collection. Although these challenges may be resolvable in many cases, they may render the comprehensive submission of research impacts impractical, except at the system-wide level through, for instance, econometric analysis. A more selective yet systemic approach to assessing research impact, based on the UK REF is a possible solution, as is another model that may use a more focused examination of the university processes that promote research impact (i.e. requiring fewer case studies or exemplars than the REF). Additionally, there may be ways of using metric based indicators of research impact that are less burdensome yet still meet the objectives of the exercise. The various options are discussed further in section 5.4.2. Consultation is being sought from stakeholders about the coverage required for the robust assessment of impact.

Depending on the definition adopted, similar issues are less likely to arise for the assessment of research engagement. For example, through ERA, universities are already required to provide comprehensive data on various measures of research application such as patents, research commercialisation income, and external funding received from industry and competitive government grants.¹² In addition, ERA 2015 collected “research reports for an external body” (sometimes referred to as grey literature) as a way of capturing important research produced by university researchers for industry, government, and the not-for-profit sector.¹³ As universities are currently collecting this information for ERA there would be little extra cost in adapting these measures as part of an engagement and impact assessment.

Even where additional engagement data is required for assessment, universities may have ready access to the information for other purposes or may be able to set up data collections easily. Apart from ERA, universities already provide a range of data to Government on research engagement, for example, for the National Survey of Research Commercialisation and ABS research data collections. The ATSE pilot, which reported in March 2016, noted that some universities were able to identify extension activities income linked to particular research projects or outputs. This specific type of income was included in the overall methodology the ATSE engagement metrics arising from the pilot.¹⁴ Other information, such as community

¹⁰ ARC, 2015, *ERA 2015 Submission Guidelines*, available at [ERA 2015 key documents](#)

¹¹ REF, 2011, *Assessment framework and guidance on submissions* p. 27

¹² See sections 5.5 and 5.6 of the *ERA 2015 Submission Guidelines* available at [ERA 2015 key documents](#)

¹³ See section 5.4.9.7 of the *ERA 2015 Submission Guidelines* available at [ERA 2015 key documents](#)

¹⁴ ATSE, 2016, *Research Engagement for Australia: Measuring research engagement between universities and end users*, A Summary to the Report, p. 5

participation in events or audience numbers at performances, which are particularly relevant to the HASS disciplines, may be able to be collated without excessive burden for universities.

An additional consideration in terms of the scope of the assessment is determining what members of a university should be covered by the assessment. Universities have direct relationships with their staff (general staff, teachers and researchers) and students (covering both research (postgraduate) and coursework (undergraduate and postgraduate)). ERA has focussed on research staff at universities and excludes students (including higher degree research (HDR) students) from its collection.¹⁵ This approach may not be appropriate for the engagement and impact assessment as it may overlook significant engagement and impact activity in universities. It may be that capturing of the destination of higher degree research (HDR) students outside of academia and in industry (or other relevant sectors) could be included in the assessment in some way. Similarly, the destination of professional Masters students or the existence professional programmes relating to research strengths of universities may also be relevant. Alternatively, it is likely that undergraduate student destinations and programmes may be less relevant as undergraduate students typically do not conduct research—a possible exception may be specific programmes of industry or end-user placement of undergraduate students.

Consultation questions

- 3. How should the scope of the assessment be defined?**
- 4. Would a selective approach using case studies or exemplars to assess impact provide benefits and incentives to universities?**
- 5. If case studies or exemplars are used, should they focus on the outcomes of research or the steps taken by the institution to facilitate the outcomes?**
- 6. What data is available to universities that could contribute to the engagement and impact assessment?**
 - i. Should the destination of Higher Degree Research students be included in the scope of the assessment?**
 - ii. Should other types of students be included or excluded from the scope of assessment (e.g. professional Masters level programmes, undergraduate students)?**

5.3 Key issues

The academic literature and the various trials of research assessment have identified a number of key challenges in assessing research engagement and impact. Many of these challenges are more difficult to resolve when assessing impact rather than measuring engagement. However, a narrow focus on limited engagement measures could create perverse outcomes where, for example, researchers and universities focus on boosting their reportable performance instead of pursuing genuine research engagement that translates into economic, social or other benefits. In addition, the use of a very limited range of metrics may not meet the parameters of the assessment—such as ensuring no discipline is disadvantaged by the assessment.

The challenges to engagement and impact assessment can be summarised as follows:

- difficulties in attribution
- managing time-lags between research and its effects
- balancing data collection and verification against reporting burden
- managing disciplinary differences (including interdisciplinary and multidisciplinary research).

¹⁵ Some HDR students do have their research captured in ERA but this only occurs if they are also an eligible research staff member at a university or jointly publish with someone who is an eligible researcher (typically a PhD supervisor or equivalent).

Consultation question

- 7. *What are the key challenges for assessing engagement and impact and how can these be addressed?***

5.3.1 Determining the attribution of research engagement and impact

A major difficulty in assessing impact is determining to whom, and to what degree, an identifiable impact can be attributed. For example, a particular innovation or impact can draw from a number of research projects. Conversely a single research project may impact on a number of different innovations and lead to a number of social, economic and environmental outcomes. The distribution of impacts from a research project or projects can be highly skewed. In this respect, some research may provide incremental advances, while other research has major and far-reaching impacts—sometimes referred to as block-bluster projects.

The beneficiaries of research beyond academia are different from the organisations (or researchers) that undertook the research. This can create difficulties in knowing where to look for evidence of research impact. Innovations and other benefits from research can occur that are not envisioned by the researcher. The impact of research beyond academia is dependent on external factors and actors outside of the university system. The combination of these effects can mean that assessing overall research performance in terms of its impacts is difficult.¹⁶

The UK REF managed this issue by asking universities to submit case studies of research impact and include supporting evidence (this method will be discussed in more detail below). Responsibility was placed on the university to demonstrate examples of impact—committees of experts then reviewed these claims.

The attribution problem does not occur to the same extent for measures of research engagement, as actions of researchers (through collaborations, research contracts etc.) or organised research projects/units (receiving research income or generating patents) are more directly identifiable.

The issue of attribution also raises the question of what is the most appropriate level of granularity and classification for measures to be aggregated. In ERA, measures such as patents and research commercialisation income (along with all ERA measures) are assigned to fields of research by the university with the ERA quality evaluations conducted at the 2-digit and 4-digit ANZSRC fields of research level. Seeking comparability with ERA results may be a reason for adopting a similar level of granularity and classification for the engagement and impact assessment. However, considerations such as the appropriateness of indicators to beneficiaries (rather than just researchers), the interdisciplinary and multidisciplinary nature of engagement and impacts, and ensuring the integrity of data classification may mean that other levels of granularity and classification are more suitable for the engagement and impact assessment.

Consultation questions

- 8. *Is it worthwhile to seek to attribute specific impacts to specific research and, if so, how should impact be attributed (especially in regard to a possible methodology that uses case studies or exemplars)?***
- 9. *To what level of granularity and classification (e.g. ANZSRC Fields of Research) should measures be aggregated?***

¹⁶ OECD, 2011, *Actor Brief: Higher Education Institutes (HEIs)*, OECD Publishing, and Productivity Commission, 2007, *Public Support for Science and Innovation*, Canberra p. 323

5.3.2 Managing time-lags

There can be major and highly variable time-lags between the conduct of research and the identifiable benefits of that research for society. The time-lag can be in the order of decades and beyond the life of a researcher or organisation. It has been estimated that the average time for translating research in the biomedical and health sciences into societal benefit is 17 years.¹⁷ The translation of fundamental research can be much longer. Other analyses have found shorter periods for the realisation of research impact— with a review of the REF impact case studies estimating “three to nine years for research to have an impact on society”.¹⁸ Furthermore, the review found that “the speed by which that impact occurs varies by discipline”.¹⁹ An impact assessment approach that does not appropriately address time-lags in terms of length and variability may result in some researchers focussing on short-term research with readily identifiable benefits. This could be to the detriment of long-term research projects that can have significant, long-lasting benefits that are not immediately apparent, noting however that there will still be significant incentives for such longer term research from competitive grants processes and broader reputational drivers.

To address this the REF 2014 permitted a timeframe of up to 15 years between the impact and the research, with panels having the flexibility to extend this in fields where the time-lag between research and impact may typically be longer. The reference period in which impact data was collected was 1 January 2008–31 July 2013, and research underpinning the impact could be included from a time period of 15 years before the reference period.²⁰ A similar approach was taken in the Excellence in Innovation for Australia (EIA) trial.²¹ However, when taking together the timeframe for the impact reference period and the underlying research, the assessments could be based on research conducted more than 20 years previously, raising questions about the current relevance of the assessment results. In addition, there is also the issue of how to assess the ongoing impacts arising from the same underlying research in future iterations of an assessment. Focussing on the processes adopted by universities to promote the impacts of their research may be a way of addressing this issue.

The typical measures of engagement have less time-lag as they tend to be based on activities and inputs rather than outcomes—for example, conducting research projects or securing industry investment. Rewarding improvements in recent practices may be a consideration. The advantage of rewarding recent practices is that it may provide increased incentives for universities to respond to the assessment. How the reference period for engagement relates to that for impact (if they are different) is an issue for this consultation.

Consultation questions

10. What timeframes should be considered for the engagement activities under assessment?

11. What timeframes should be considered for the impact activities under assessment?

¹⁷ Slote Morris, Z., Wooding, S. & Grant, J., 2011. “The answer is 17 years, what is the question: understanding time lags in translational research”, *Journal of the Royal Society of Medicine*, 104(12), pp. 510-520.

¹⁸ King’s College London and Digital Science, 2015, *The nature, scale and beneficiaries of research impact: An initial analysis of Research Excellence Framework (REF) 2014 impact case studies*, p. 45

¹⁹ King’s College London and Digital Science, 2015, *The nature, scale and beneficiaries of research impact*, p. 45

²⁰ REF, 2011, *Assessment framework and guidance on submissions*, p. 1.

²¹ EIA Trial – ATN-Go8, 2012, *Guidelines for Completion of Case Studies in ATN/Go8 EIA Impact Assessment Trial*, p. 6.

5.3.3 Balancing data collection, verification and cost

A robust measure of research impact for the university sector may require the collection and evaluation of significant information from universities not currently reported to government. Stakeholder feedback is being sought on the balance between the reporting costs and the benefits of given indicators.

Approaches to assessing research impact that use case studies or exemplars can more effectively capture the detail and complex nature of research impact than metrics. Case studies or exemplars also provide universities with significant opportunities to promote their research and encourage interest from stakeholders beyond the university sector. Many universities already produce case studies or exemplars of their research for these purposes without the additional incentives created by an impact assessment (see section 5.4.2 for further information on the incentives from impact assessment).

However, substantial case study approaches could place a significant compliance burden on the sector. The REF has shown case studies can be expensive to produce. It was estimated that the overall cost for the six-year assessment was GBP 55 million (GBP 9 million annualised) for the submission of research impact (about 6700 case studies). The estimated median cost was about GBP 7500 per case study and GBP 4500 per case study template report. The review of the REF found that reporting costs for universities was concentrated in the two years preceding the REF submission deadline.²² In the context of GBP 27 billion total research income from public sources in the UK over a six-year period, the GBP 55 million for the impact element of the REF 2014 is about 0.2 per cent of the total investment in UK research.²³

Indicators for assessing research engagement may use data already reported by universities, resulting in little additional cost to universities (depending on the indicators chosen). The approach used by ATSE in developing its engagement metric using ERA and HERDC data is a clear example of a low-cost form of assessment. Alternatively, there may be a combination of indicators selected (potentially different indicators for different disciplines), which may require universities to collect and report some additional data. (See the discussion of student destination data in section 5.2.2 above).

Consultation question

12. How can the assessment balance the need to minimise reporting burden with robust requirements for data collection and verification?

5.3.4 Managing disciplinary differences

Engagement activities and research impacts vary significantly across different disciplines and this creates challenges in determining the indicators that are best suited for assessment. For example, patents are often viewed as an important way of translating research into commercial benefit. However, while patents are highly applicable to certain fields and types of research (such as the engineering and biotechnology fields), there are research fields in which many important research outcomes cannot be patented—as innovations including mere ideas, schemes or plans, scientific theories, mathematical algorithms, and inventions within the realms of the fine arts have traditionally been regarded as non-patentable.²⁴

Similarly, data from previous ERA rounds—where universities are required to report their research commercialisation income for relevant fields of research—shows that the data for the Australian university

²² Technopolis, 2015, *REF Accountability Review: Costs, benefits and burden* (Report by Technopolis to the four UK higher education funding bodies), pp 6, 9.

²³ Technopolis, 2015, *REF Accountability Review*, p1

²⁴ Australian Patent Office, *Patent Manual of Practice and Procedure*, Section 2.9

sector is highly sensitive to significant levels of research commercialisation income reported by a relatively small number of universities in specific years. For example, in 2007 and 2008, two Australian universities reported very large sums of research commercialisation income in three 4-digit FoR codes under the broad field 'Medical and Health Sciences'. This led to a significant fluctuation in the sector wide aggregations of research commercialisation income across the three ERA rounds.

The REF 2014 addressed the issue of managing disciplinary differences by the use of the case-study method. This approach allowed for a wide variety of impacts and pathways to impact to be assessed—however, as noted above there are costs associated with approach. Alternatively, the ATSE trial compared performance on certain types of external research income within each discipline (at the 2-digit FoR level), therefore accounting for disciplinary differences. This approach requires that the metrics chosen have sufficient data in terms of coverage across all universities participating within a given discipline for robust evaluation of the data to take place. There is some concern that the metric of external research income used in the ATSE trial does not fully address the issue of data reliability for all disciplines and that additional measures may be required.

It is also recognised that a significant portion of research conducted in universities is now interdisciplinary or multidisciplinary in nature. This type of research encourages innovations and advances in research as new perspectives and ways of thinking are brought to bear on research problems. Similarly, commercialising research or translating it in social or economic benefits often requires the input from researchers or research beneficiaries outside of individual disciplinary boundaries. Although ERA is a disciplinary based evaluation it facilitates the evaluation of interdisciplinary and multidisciplinary research by allowing universities to apportion such research to multiple disciplines. Depending on the classification or granularity adopted for the assessment, a similar approach may be suitable for developing the indicators of engagement and impact. Alternatively, it may be more appropriate to aggregate and evaluate research engagement, pathways to impact, or research impacts with mechanisms that can identify and account for its interdisciplinary or multidisciplinary characteristics.

The parameters and guiding principles of the assessment require that the need to manage disciplinary difference (including interdisciplinary and multidisciplinary research) is addressed in the methodology that is adopted. Feedback is being sought from stakeholders about practical measures that can be used to manage this issue.

Consultation questions

13. What approaches or measures can be used to manage the disciplinary differences in research engagement and impact?

14. What measures or approaches to evaluation used for the assessment can appropriately account for interdisciplinary and multidisciplinary engagement and impacts?

5.4 Types of indicators

One of the key purposes of this consultation is to seek views from stakeholders on what indicators should be used to assess engagement and impact of university research. The following section provides an overview of recent literature and reviews of research engagement and impact. It also presents specific questions for stakeholder feedback. For reference, there is also a table of previously considered commercialisation metrics (from 2005) included at **Appendix B**. Stakeholders may wish to refer to this table when answering the questions relating to what types of engagement and impact indicators should be used. However, stakeholders are also encouraged to identify and provide views regarding any other indicators (in addition to or instead of those listed in Appendix B) that they consider relevant for assessing engagement and impact.

5.4.1 Identifying engagement indicators

There are a series of indicators that present themselves for measuring research engagement. Examples such as research commercialisation income, patenting, registered designs and plant breeder's rights are already collected in ERA—however, these measures are limited to the research fields that are considered to be relevant and some apply to only a few disciplines. Other government data collections include metrics on intellectual property licencing values, start-up companies, contract research and consultancy activity (in addition to research commercialisation and patents). ATSE also developed metrics based on research income that ranked Australian university engagement by discipline using ERA (and HERDC) data.²⁵ However, as noted in the *Review of Research Policy and Funding Arrangements*, the income measures were considered by many stakeholders as less appropriate for the humanities, arts and social sciences (HASS) disciplines²⁶— as noted above, the ATSE solution was to compare results within disciplines.²⁷

Where data exists, metrics are less expensive and can provide a more comprehensive coverage of the sector than alternatives such as case studies. However, metrics may not capture the complexity of some forms of research engagement, and may be skewed against certain industry sectors and disciplines. In addition, depending on the level of granularity that is adopted for the assessment, it may be necessary to consider mechanisms for metrics that will ensure the integrity of data classifications.

International studies of research engagement have also highlighted the need to ensure that meaningful indicators of engagement and collaboration are used. Some measures, if used in isolation or out of context, can be perverse indicators and counter-productive in the longer term.²⁸ In addition, there is evidence informal measures can be more valued by industry than more formalised measures. As noted in a recent report discussing a survey of UK-US firms which looked at the value that businesses placed on different types of collaboration:

The UK-US survey in addition asked the responding firms to indicate the types of university-industry interactions contributing to their innovation activities. In both countries, informal contacts were the most important contribution, followed by recruitment at first degree or Masters level, publications and conferences. This is consistent with the results for the UK emerging from the study by Bruneel et al. (2009). Some differences between the countries do emerge, especially in terms of the relatively more intensive use of, and value placed upon, internships in the US compared to the UK. It is important to note that patenting and licencing appear low down the list of business perceptions with regard to university interactions contributing to innovation. The UK-US survey also probed specifically into mechanisms for the acquisition of new technology involving universities rather than innovation-related activities more generally. Once again, in both countries publications and informal contacts were top of the list, whilst licencing was low down in terms of frequency and the value placed upon it.²⁹

A recent OECD review, *Commercialising Public Research: New Trends and Strategies*, has drawn similar conclusions. A table from the report summarising the level of formalisation and the significance for industry

²⁵ The Academy of Technological Sciences and Engineering (ATSE), 2015, *Research Engagement for Australia: Measuring Research Engagement Between Universities and End User*.

²⁶ Watt, I. 2015, *Report of the Review of Research Policy and Funding Arrangements*, pp 70-71.

²⁷ The ATSE rationale was: "It was decided early on in the REA development that it would be critical that comparisons between different universities across the country with respect to their level of engagement should be carried out within disciplines and not across disciplines, i.e. it would be unfair to compare the level of engagement dollars attracted by history research with that attracted for medical research. Comparing within disciplines is an inherently fair process." ATSE, 2016, *Research Engagement for Australia: Measuring research engagement between universities and end users*, p. 5.

²⁸ Hughes, A. & Martin, B. R., 2012, *Enhancing Impact: The Value of Public Sector R&D*, Council for Industry and Higher Education and UK-Innovation Research Centre, p. xiii

²⁹ Hughes, A. & Martin, B. R., 2012, *Enhancing Impact: The Value of Public Sector R&D*, Council for Industry and Higher Education and UK-Innovation Research Centre, p. 37

of various forms of research engagement (or knowledge transfer), is included as **Appendix C**. Both Appendix B and Appendix C specifically address the commercialisation of academic research. As noted above a variety of other engagement indicators may be needed for some disciplines. The advancement of technology enables some of these to now be collected systematically without significant reporting burden. For instance potential indicators of institutional media presence and uptake are now already captured by organisations such as *The Conversation* and the *Australian Science Media Centre*.

Consultation question

15. What types of engagement indicators should be used?

5.4.2 Identifying impact indicators

The broad definitions adopted for research impact have meant that there are no clearly defined indicators for research impact. For example, the REF considered that:

impact includes, but is not limited to, an effect on, change or benefit to:

- the activity, attitude, awareness, behaviour, capacity, opportunity, performance, policy, practice, process or understanding
- of an audience, beneficiary, community, constituency, organisation or individuals
- in any geographic location whether locally, regionally, nationally or internationally.

Impact includes the reduction or prevention of harm, risk, cost or other negative effects.³⁰

In the past, the use of case studies which are peer reviewed in some form has been considered the primary solution. It places the onus on universities to demonstrate their research impact to expert reviewers. In addition to being a potentially high cost form of assessment, the Productivity Commission (PC) also raised concerns—in 2007 around the time that the RQF was being developed—about the use of case studies to evaluate research impact. In particular, the PC noted that selected case studies, even if done well, may not be appropriate indicators of the overall impact of a research programme because:

If measurement focuses on those projects with the highest returns it gives a misleading picture of program impacts. Most [research] programs could be expected to have a share of ‘failures’ or low/negative return projects ex post.³¹

However, the RAND UK review of the REF found that case studies were the most appropriate means of impact assessment because the issues of breadth and diversity were addressed. It also concluded that the REF’s overall method of impact assessment led to benefits including:

the ability to identify and understand impact; the stimulation of broader strategic thinking about impact; the increased recognition within HEIs of those academics undertaking impact activities; and the opportunity to review and reaffirm relationships with external stakeholders.³²

In addition to detailing the impact of their research, the REF also required explanations of how universities supported the development of impact—that is, universities were asked to show what processes were in place to promote the impact of their research. For example, universities were required to describe their approach to interacting with non-academic users and beneficiaries of research for a subject area (or unit) by including details such as:

³⁰ REF, 2011, *Assessment framework and guidance on submissions*, p. 26.

³¹ Productivity Commission, 2007, *Public Support for Science and Innovation*, Canberra, p. 326

³² Manville, C., Jones, M. Frearson, M., Castle-Clarke, S., Henham, M., Gunashekar, S., and Grant, J., 2014, *Preparing impact submissions for REF 2014: An evaluation*, RAND Europe, p. xii.

- how staff in the unit interacted with, engaged with or developed relationships with key users, beneficiaries or audiences to develop impact from the research carried out in the unit
- evidence of the nature of those relationships and interactions
- evidence of follow-through from these activities to identify resulting impacts
- how the unit specifically supported and enabled staff to achieve impact from their research
- how the unit made use of institutional facilities, expertise or resources in undertaking these activities
- other mechanisms deployed by the unit to support and enable impact.³³

Universities were also asked to describe their strategies and plans for impact and, where possible, show “how the selected case studies relate to their approach to achieving impact... [including] how particular case studies exemplify aspects of the approach, or how particular case studies informed the development of the unit’s approach”.³⁴ A focus on the processes or approaches to impact used by universities may be more appropriate in the Australian context. By focussing on impact processes— rather than the impacts—many of the concerns regarding extensive time-lags or reliance on conditions outside of the researcher’s/university’s control can be minimised as recent university processes would be the reference point of assessment rather than possible externalities or research produced up to 20 years previously. It may also be possible that such a methodology could use a small number of case studies or exemplars per university, covering the breadth of university research disciplines, to adequately form a basis for assessing the impact element of university research and incentivise universities to translate their research into greater economic, social and other benefits.

The possibility of not pursuing methods that rely on case studies or exemplars for assessing research impact also requires consideration. There may be options for the collection and evaluation of data that relates to either research impact or the processes used to promote impact. Recent econometric based studies such as the reports commissioned by the Office of the Chief Scientist have shown the economic contribution of advances in science to Australia’s economy.³⁵ There may be some appropriate econometric methods that could be used as indicators of impact—such as data collection of ABN numbers associated with university research to allow for econometric tracking of impact activities. Other data collections that may be useful impact indicators include citation information relating to patents. A 2013 pilot, undertaken by the Department of Industry and IP Australia along with 12 Australian universities, concluded that it was possible to use “patent metrics to assess the scope and impact of inventions originating from university research”.³⁶ Finally, there are data providers which collect research metrics of internet downloads, blogs, Wikipedia entries, Twitter and other social media (for example Altmetrics by Digital Science, The Conversation and the AusSMC), which could be used as measures of impact in disciplines where, patenting for example, is not widespread. Although the metrics used to assess impact (or pathways to impact) may be less developed than those measuring engagement, it may be possible through the development of the assessment to identify a suite of metric based indicators that can form a robust assessment of research impact. Surveys of industry and other end-users or beneficiaries of research may also be valuable indicators in this regard. Consultation is being sought on what range of indicators should be used to assess research impact or impact processes.

Consultation question

16. What types of impact indicators should be used?

³³ REF, 2012, *Panel criteria and working methods*, p. 33

³⁴ It was noted that some case studies presented would have research that pre-dated their approaches to impact. REF, 2012, *Panel criteria and working methods*, p. 34

³⁵ Office of the Chief Scientist, 2016, *The importance of advanced physical, mathematical and biological sciences to the Australian economy*.

³⁶ Department of Industry, 2013, *Research Performance of University Patenting in Australia: A Pilot Assessment*

6 Appendix A: Stakeholder feedback template

Please provide feedback by emailing the ARC at [ARC-EI_consultation\[@\]arc.gov.au](mailto:ARC-EI_consultation[@]arc.gov.au)

Feedback is due 24 June 2016.

Please specifically address the following questions you consider relevant to you and/or your organisation. If possible, please use MS Word or equivalent.

Feedback Questions

Definitions and scope

1. *What definition of 'engagement' should be used for the purpose of assessment?*
2. *What definition of 'impact' should be used for the purpose of assessment?*
3. *How should the scope of the assessment be defined?*
4. *Would a selective approach using case studies or exemplars to assess impact provide benefits and incentives to universities?*
5. *If case studies or exemplars are used, should they focus on the outcomes of research or the steps taken by the institution to facilitate the outcomes?*
6. *What data is available to universities that could contribute to the engagement and impact assessment?*
 - i. *Should the destination of Higher Degree Research students be included in the scope of the assessment?*
 - ii. *Should other types of students be included or excluded from the scope of assessment (e.g. professional Masters level programmes, undergraduate students)?*

Key Issues

7. *What are the key challenges for assessing engagement and impact and how can these be addressed?*
8. *Is it worthwhile to seek to attribute specific impacts to specific research and, if so, how should impact be attributed (especially in regard to a possible methodology that uses case studies or exemplars)?*
9. *To what level of granularity and classification (e.g. ANZSRC Fields of Research) should measures be aggregated?*
10. *What timeframes should be considered for the engagement activities under assessment?*
11. *What timeframes should be considered for the impact activities under assessment?*
12. *How can the assessment balance the need to minimise reporting burden with robust requirements for data collection and verification?*
13. *What approaches or measures can be used to manage the disciplinary differences in research engagement and impact?*
14. *What measures or approaches to evaluation used for the assessment can appropriately account for interdisciplinary and multidisciplinary engagement and impacts?*

Types of engagement and impact indicators

15. *What types of engagement indicators should be used?*
16. *What types of impact indicators should be used?*

Other

17. *Are there any additional comments you wish to make?*

7 Appendix B: Table of previously considered commercialisation metrics—2005

Source: This table is from: *Metrics for Research Commercialisation: A Report to the Coordination Committee on Science and Technology, 2005*, “Table 2: Matrix of research commercialisation metrics” p. 16. Also reproduced in P. Wellings, 2008, *Intellectual Property and Research Benefits*, p. 23. Please **do not limit** your feedback to these metrics.

Main data groups	Supply side: Publicly Funded Research Sector		Demand side: Business & Community	
	Inputs/Activities	Outputs/Deliverables	Intermediate Outcomes	Final Outcomes
Intellectual Property (identification, protection, transfer, exploitation)	1. Patent Applications (including Plant Breeders Rights) & Patents Issued (No.) 2. Invention disclosures (No.) 3. Commercialisation Staff (No. & Costs) 4. Commercialisation Administration (Cost) 5. IP policies & practices (Documented & Applied)	6. Licences, Options, Assignments (No. & Value) 7. Royalty agreements (No. & Value) 8. Pilots/Prototypes/ Clinical Trials (No.) 9. Client relations (No. of contacts/ interactions)	10. Gross revenue from licensed technology 11. New products, services or business processes 12. Start-ups/Spin-outs (No., capitalisation & revenue) 13. Joint Ventures (No., capitalisation & revenue) 14. Initial Public Offerings (No., & capitalisation) 15. Venture capital deals (No. & value)	Changes in: <input type="checkbox"/> GDP <input type="checkbox"/> Investment <input type="checkbox"/> Employment <input type="checkbox"/> Exports <input type="checkbox"/> Health outcomes <input type="checkbox"/> Environmental outcomes that can be reasonably linked to research commercialisation intermediate outcomes (using econometric analyses and studies).
Research Contracts & Consultancies	16. Research contracts (No. & Gross Revenue) 17. Consultancies (No. & Gross Revenue) 18. Joint Ventures (No. & Capitalisation) 19. ARC Linkage Projects (No. & Value) 20. Administration (Cost)	21. Reports (No.) 22. Publications (No. & type) 23. Conferences/ Seminars (No. & attendance) 24. Client relations (No. of contacts/interactions) 25. Standards & best practices	26. Business expenditure on R&D (BERD) in the public sector (Quantum & % of total BERD) 27. Repeat business (% of contracts with previous clients) 28. Flow-on business (No. of clients who become patent licensees and/or partners in JVs, spin-outs etc.)	
Skills Development & Transfer	29. Commercialisation & entrepreneurial training for researchers (No. of courses offered, No. of graduates) 30. Scientific & research training for Industry (No. of courses offered, No. of graduates) 31. Course design – industry input & endorsement (No. of postgraduate courses with industry input to design and/or industry endorsement)	32. Research graduates employed in industry (No. & % total cohort) 33. Industry funded postgraduate places 34. Staff exchanges (No. of Researchers to industry; industry to research sector) 35. Research student placements in industry (No.)	36. Industry sector satisfaction with quality of research graduates 37. New practices 38. New products/services 39. Research postgraduate income 40. Research postgraduate Start-ups & Spin-outs	

8 Appendix C: Summary—knowledge transfer and commercialisation channels

Channels	Description	Characteristics			
		Degree of formalisation	Degree of finalisation	Relational intensity	Significance for industry
Publishing	Most traditional and widespread mode of transmission of knowledge; mostly limited to published papers	Low	High	Low	High
Conferencing, networking	Professional conferences, informal relations, casual contact and conversations are among the channels ranked as most important by industry; important across sectors	Low	Low	Medium	High
Collaborative research and research partnerships	Situations where scientists and private companies jointly commit resources and research efforts to projects; research carried out jointly and may be co-funded (in relation to contract research); great variations (individual or institutional level); these range from small-scale projects to strategic partnerships with multiple members and stakeholders (i.e. public-private partnerships [P/PPs])	Medium	Low	Low	High
Contract research	Commissioned by a private firm to pursue a solution to a problem of interest; distinct from most types of consulting; involves creating new knowledge per the specifications or goals of client; usually more applied than collaborative research	High	High	High	High
Academic consulting	Research or advisory services provided by consulting researchers to industry clients; most widespread activities - yet least institutionalised-in which industry and academics engage; three different types: research-, opportunity - and commercialisation-driven consulting; important to industry, which usually does not compromise university missions	Medium	High	High	High
Industry hiring, student placement	Major motivations for firms to engage in industry-science linkages with main benefit for universities; occurs through (e.g.) joint supervision of theses, internships, or collaborative research	Medium	Low	Medium	Medium
Patenting and Licensing	Ranked among the least important channels by both industry and researchers; substantial attention both in academic literature and among policy makers; little transfer of tacit knowledge	High	High	Low	Low
Public research spin-offs	Received substantial attention, although a rare form of spin-offs "entrepreneurship" compared to alumni and student start-ups	High	High	Low	Low
Personnel exchanges/ intersectoral mobility	May take many forms; usually university or industry researchers spending time in the alternate settings; most important form of "personnel mobility" is employment by industry	High	Low	Medium	Low
Standards (Box 1.1)	Documents based on various degrees of consensus; at least as important as patents as a knowledge transfer channel	High	High	Low	Medium

Source: OECD, 2013, *Commercialising Public Research: New Trends and Strategies*, “Table 1.1. Summary of selected knowledge transfer and commercialisation channels”, p 20.

Note the characteristics are defined in the report as:

Extent of direct personal involvement (relational intensity). Knowledge transfer tends to be associated with tacit and explicit knowledge. Tacit knowledge can be hardly codified and communicated. The transfer of knowledge requires close interaction between knowledge creators and users (i.e. researchers and/or industry). For example, a publication is associated with low relational intensity, while joint research would have a high relational intensity.

Significance to industry. When seen from the perspective of industry, the relative importance of channels varies. Business surveys show that publications and collaborative research are rated highly significant, while patent and licensing based channels are rated low.

Degree of knowledge finalisation. Knowledge finalisation refers to the degree to which a research project provides a specific goal or can be contained in deliverables (e.g. contract research), as opposed to producing public sector knowledge and/or enlarging the stock of knowledge whose outcomes are difficult to measure/anticipate (e.g. conferencing).

Degree of formalisation. Channels for knowledge transfer can be categorised as either informal channels – such as staff exchange or networks (involving tacit flows) – and formal channels that involve a contract between the public research organisation (PRO) and the firm, a license, a joint patent, or participation in a university spin-off. Channel formalisation refers to the extent to which the interaction is institutionalised and/or guided by formal rules and procedures.³⁷

³⁷ OECD, 2013, *Commercialising Public Research*, p 19.

9 Appendix D: Acronyms

ABS	Australian Bureau of Statistics
ANZSRC	Australia and New Zealand Standard Research Classification
ARC	Australian Research Council
ATN	Australian Technology Network
ATSE	Australian Academy of Technological Sciences and Engineering
EIA	Excellence in Innovation for Australia
ERA	Excellence in Research for Australia
FoR	Field of Research
Go8	Group of Eight
HASS	Humanities, Arts and Social Sciences
HEFCE	Higher Education Funding Council for England
HEI	Higher Education Institution
HERDC	Higher Education Research Data Collection
IRU	Innovative Research Universities
NISA	National Innovation and Science Agenda
OECD	Organisation for Economic Co-operation and Development
RAE	Research Assessment Exercise
RBG	Research Block Grants
REF	Research Excellence Framework
RQF	Research Quality Framework
SEO	Socio-Economic Objective
STEM	Science, Technology, Engineering and Mathematics
UoA	Unit of Assessment
UoE	Unit of Evaluation