Response to the ARC Engagement and Impact Assessment Consultation Paper from the Australian Mathematical Sciences Institute, the Australian Mathematical Society, and the ARC Centre of Excellence for Mathematical and Statistical Frontiers

Feedback Questions

Definitions and scope

1. What definition of 'engagement' should be used for the purpose of assessment?

We support the ATSE definition as given in the Consultation paper; where engagement is defined in terms of interactions with research partners in industry and the wider community. However, we note that for many enabling disciplines, such as the mathematical sciences, this engagement can often occur in the form of participation in a pipeline leading from potentially quite theoretical research, through more applied research in the same discipline, through to academic researchers in cognate disciplines before it actually involves the end user. The involvement of the mathematical sciences in a particular engagement is often critical, but in some cases may only be framed in terms of interaction with other academics along the pipeline, rather than directly with the end-user. It needs to be noted further that the time-scales for such "pipeline" engagements are usually significantly longer than those for direct academic-to-end-user engagements, which are more common in other disciplines.

2. What definition of 'impact' should be used for the purpose of assessment?

A broad definition involving the impact of research outside the university sector is appropriate, along the lines of the UK REF and the ARC definitions provided in the Consultation paper. Consideration should be given to impacts that provide more general benefits to society as well as immediate commercial benefits to industry. In this regard, a list along the lines of the U.S. National Science Foundation's "broader impact themes" could also be considered. As with engagement, it is important to realise that the typical timescale necessary to realise an impact varies significantly among disciplines, with the enabling disciplines such as the mathematical sciences often having very long time periods between the original research activity and the realisation of its impact.

3. How should the scope of the assessment be defined?

Given the broad and complex nature of research engagement and impact it is not feasible to replicate ERA and measure all activities that occur.

Clearly income measures are already available via HERDC and can be used in the assessment. However, HERDC income measures are only a coarse measure of return on investment (RoI). For example, mathematical sciences collaborations are relatively low cost and have a relatively high RoI. The same is true for PhD internships in all disciplines. We suggest that universities follow up on collaborative grants to ascertain RoI for use as a second order measure of impact.

Some international grants (such the EU IRSES scheme) exclude direct incomes for Australian partners but illustrate engagement and impact as far as they include non-academic partners.

Also there are data associated with higher degree research students, including industry PhDs and industry research internships, that should be collected and assessed.

We strongly recommend additional national assessment of discipline impact, as opposed to just university by university discipline impact. Our reason is that this will capture the collaborative nature of some disciplines, such as the mathematical sciences, which have peak discipline bodies and learned societies, which undertake multi university industry collaborations. AMSI is in exactly this category, with its PhD industry research internship program; the ATN's Industry Doctoral Training Centre in the mathematical sciences is another example.

In addition, there are sound reasons for national discipline assessments because these directly influence strategic planning at national level to turn around Australia's poor university-industry collaboration rates and the low uptake of research trained graduates by the private sector.

Since our claim is that our discipline's engagement and impact at a national level is greater than the sum of the universities' contributions there needs to be an effective measure at this national level. We suggest that this be measured by the expenditure of learned societies and discipline peak bodies on industry engagement at the 2 digit FOR code level (and specific to that code).

We believe any measures relating to community participation/audience numbers/website views be designed carefully. It may be very costly to collect, and potentially unreliable. However, we cannot ignore the role that new and social media will play in business, industry and academia in the future. We do not recommend the inclusion of such measure in 2017, however we do recommend that carefully designed measures that are capable of capturing this type of impact be considered for the future. Ignoring them would miss a large part of community and social impact and could also risk creating the appearance that research and engagement measures are traditional in nature and 'dated'.

Case studies will be a useful tool to highlight the best and most important examples of engagement and impact.

4. Would a selective approach using case studies or exemplars to assess impact provide benefits and incentives to universities?

Case studies are appropriate but the total number submitted by each institution should be limited to one case study at each two digit FOR code, to minimise the assessment burden. Universities should be able to choose the FOR codes they wish to nominate for assessment, regardless of the shape of their ERA submission.

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?

ERA measures outcomes so this assessment process should only measure outcomes too

6. What data is available to universities that could contribute to the engagement and impact assessment?

The number of academic publications with an industry co-author. Non-academic publications like reports, professional publications and general media, even without industry co-authors, are also suitable to capture the broad nature of engagement. Citations to all papers from industry authored works could also be used as an impact measure.

Suggestions relating to higher degree research students include: the number of industry

Internships as well as supervisions and scholarships. The AMSI Intern program is in the process of being expanded to a national scale by government and clearly university uptake of internships will be a key engagement and impact measure.

Academic staff who hold external board and panel memberships may also be a useful measure as are honorary academic appointments for industry staff.

i. Should the destination of Higher Degree Research students be included in the scope of the assessment?

Ideally yes, however, unless a comprehensive longitudinal research graduate survey is introduced in Australia, this is very difficult and costly to gather data on. The NZ Graduate Longitudinal Survey commenced in 2011 and is attempting to follow university graduates for up to 10 years, post-graduation. The 10-year duration of the NZ study indicates that any corresponding Australian study would provide little or no useful data for a 2018 assessment exercise or even for 2021.

ii. Should other types of students be included or excluded from the scope of assessment (e.g. professional Masters level programmes, undergraduate students)?

Students that conduct major research projects should be considered for inclusion. This could encompass Honours and coursework Masters students that complete a major research project.

Key Issues

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

The ERA2015 assessment of FOR code 01 Mathematical Sciences, indicated that wide variations exist at the four digit FOR code level between the shares of Categories 1, 2, 3 and 4 income. For example, Pure Mathematics, 0101 had 30% of the journal articles and 35% of the Cat. 1 income of 01, but only a 7% share of the Cat 2-4 income. This indicates that the sub-disciplines of Pure Mathematics are quite different to those of Applied Mathematics and Statistics in the nature and level of its industry engagement and impact.

The differences that occur within the sub-disciplines of the Mathematical Sciences are likely to be even wider between some STEM and HASS disciplines.

Field normalisation is undertaken for citation rates and it seems the only useful technique to apply for this assessment exercise too.

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)?

The mapping of impacts to specific research is likely to only be possible for special examples as explored in the Case Studies.

9. To what level of granularity and classification (e.g. ANZSRC Fields of Research) should measures be aggregated?

The 2 digit FOR codes are appropriate.

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

As indicated in the responses to the first two questions, the timeframe for impact to be realized varies considerably across disciplines, but is generally considerably longer for the enabling disciplines. The timeframe will need to be longer than that for ERA, with 10 years the minimum reasonable time for the mathematical sciences.

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

See response to Question 10 above.

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

We believe that the 2018 assessment should be mostly based on existing data, as available via HERDC and/or ERA. A case study chosen by universities would allow a partial but early assessment of other impacts not represented by these data. Going forward, other data may need to be collected. The collection of additional data (such as measures of HDR student engagement and impact) is likely to be very complex and needs to be carefully planned, in consultation with the sector, to ensure that uniform measures are obtained

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

Clearly some form of field or discipline normalisation will be needed, for research incomes by FOR codes. However, it can be quite valid to assign some sources of research income to different FOR codes, for which the benchmarks are widely different.

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

Case studies seem the only valid approach for discussing interdisciplinary research.

Types of engagement and impact indicators

15. What types of engagement indicators should be used?

We believe that some indicators that measure HDR research impact and engagement are appropriate such as industry internships, supervisions, scholarships and industry funded HDR projects.

16. What types of impact indicators should be used?

We don't believe internal processes are important, only outcomes. Surveys of industries and end users may be a useful approach and is already used by QS in their university rankings. Citations to all papers from industry authored works could also be used.

Other

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

Research impact within academia (ERA assessment in the citation disciplines and the various university rankings) relies heavily on citations for the simple reason that the data is available and easy to measure. The Engagement and Impact Assessments should also be based on easily obtainable data, even if these data are imperfect proxies for the underlying process.

The Australian Mathematical Society, Australian Mathematical Sciences Institute and the ARC Centre of Excellence for Mathematical and Statistical Frontiers

9 October 2016

Professor Timothy Marchant
President, Australian Mathematical Society

Professor Geoff Prince
Director, Australian Mathematical Sciences Institute

Professor Peter Taylor
Director, ARC Centre of Excellence for Mathematical and Statistical Frontiers

Members of the Working Group:

Professor Timothy Marchant	Professor of Applied Mathematics and Dean of Research, University of Wollongong, President of the Australian Mathematical Society
Professor Peter Taylor	Australian Laureate Fellow, University of Melbourne, Director of the ARC Centre of Excellence for Mathematical and Statistical Frontiers
Ms Jessie Roberts	Queensland University of technology, Industry Officer ARC Centre of Excellence for Mathematical and Statistical Frontiers
Professor Geoff Prince	Director of the Australian Mathematical Sciences Institute
Associate Professor Marc Demange	RMIT University, School of Science, Mathematical Sciences discipline
Professor Joseph Grotowski	Head of School of Mathematics and Physics, University of Queensland