ATSE

Research Engagement for Australia

Measuring research engagement between universities and end users

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Executive Summary

The Australian Academy of Technology and Engineering (ATSE) advocates for a future in which technology, engineering and innovation contribute significantly to Australia's social, economic and environmental wellbeing. ATSE believes that realising the benefits of Australia's world-class research system requires translation of its outputs into economic and societal benefits. The effective translation of research will be at the core of Australia's future competitiveness and prosperity.

In mid-2014 a group of ATSE Fellows, concerned by the recently published data which showed that Australia was ranking bottom of the OECD when it came to collaboration between public and private sector researchers, set up a working party to develop a metric which would measure collaboration between university researchers and industry and other end users of their research. The group was alarmed by reports that the Excellence in Research Australia (ERA) exercise, while very desirable in its own right, was having the unintended effect of discouraging university-researcher collaboration with industry and other end users. The ATSE proposal was to use the income received from industry and other research end users to support research collaboration plus commercialisation income as the basis for an engagement metric. The proposal was welcomed in university, industry and government circles.

While there had been a number of previous proposals in Australia to use case studies as the basis on which research impact is measured, these proposals had not progressed because of the high cost associated with such exercises, difficulties around the attribution of impact, and the fact that such measures are a lagging indicator of university performance. Research engagement is a necessary condition for impact, and the ATSE engagement metric is a forward proxy for impact. The metric also aligns well with the measure used by the OECD.

From the outset, it was felt that it was very important that any metric developed had to be applicable and useful for the humanities, arts and social sciences (HASS) as well as science, technology, engineering and mathematics (STEM) fields. Accordingly, the Steering Committee membership for this project was expanded to include representatives of the four Learned Academies (Humanities, Social Sciences, Science, and Technology and Engineering), the Australian Research Council (ARC), senior researchers from the HASS, STEM and medical and health sciences (MHS) fields, and senior representatives of the key Commonwealth Departments (Education & Training and Industry, Innovation & Science). The Steering Committee met on two occasions face to face, three times by teleconference, and regularly electronically to comment on draft material. The project was named 'Research Engagement for Australia' (REA).

With the assistance of the Department of Education & Training (DET) and the ARC, it was shown that it is possible to develop engagement metrics from existing data collections, namely the data submitted by universities to the ARC as part of the ERA exercise, and the annual Higher Education Research Data Collection (HERDC) returns submitted to DET. The key and simplifying principle used in REA is to use external dollars attracted from industry and other end users to support research as a direct measure of research engagement. Comparisons between universities for the same research discipline were carried out by applying the metric at the two digit Field of Research (FoR) code level.

Using de-identified data provided by the ARC, it was possible to calculate the REA Metrics for the 22 two digit FoRs provided by 41 Universities in the 2012 ERA exercise. The results obtained for the REA metrics were different to those obtained for the ERA rating, showing that the engagement metrics were identifying collaborative activities in the university sector that are not distinguished by existing measures of research excellence (ERA). The results of this initial evaluation showed that areas assessed to have high end-user engagement scores predominantly had high ERA excellence scores, while areas with low ERA scores rarely had high engagement scores. Importantly, there were many cases of high ERA ratings without strong engagement. The bulk of the highest ranking areas for engagement scored ERA 4 and 5. In other words, research excellence is an important, but not sufficient, condition for collaboration and innovation.

In March 2015, a report on the development of the REA Metrics was prepared by the Steering Committee and submitted to the Department of Education and Training (the REA Proposal). This report outlined how the REA Metrics provided a measure of research engagement and collaboration as a forward proxy of impact. The REA rating is intended to visibly stand alongside the existing ERA measurement of research excellence – bringing a second dimension to the assessment of Australia's research.

Subsequently, ATSE received funding from the South Australian and Queensland Governments to conduct a pilot study of the ATSE engagement metrics (REA) with the universities in the two States – a total of eleven universities. This pilot study is described in greater detail in the body of this report, essentially representing a beta test of the ATSE engagement metrics.

The REA Pilot has confirmed that REA is a cost-effective and robust measure of research engagement: universities were able to participate in the data provisions with minimal resourcing burdens, making use of

the existing systems in support of other internal and external reporting requirements such as ERA and HERDC. The results of the REA Pilot, provided to universities, provided an intuitive and believable method of measuring research engagement. Strong REA performance was related to ongoing research engagement activities within the university and broadly accorded with the expectations of the university in terms of their perceived areas of strong research engagement. In addition, the REA Pilot confirmed earlier findings that REA measures aspects of research activity that are not captured through existing measures, such as ERA.

The pilot study has developed a mechanism that allows the private sector contributions to Rural R&D Corporations funding to be estimated and included in the metric determination. Also, a number of universities in the cohort obtain income from extension activities based on research from the universities that is not counted in HERDC returns, and it was felt that these monies should form part of the REA Metrics calculations.

To assist in identifying the different types of activity underlying REA performance, an additional contextual indicator is proposed, namely the proportional contribution of research partner income and commercialisation income for each FoR return. In addition, it is proposed that universities be given the option to provide short vignettes explaining why a particularly strong REA result for the FoR was obtained, or why specific examples of engagement were not captured by the data reported. These vignettes would be published to provide context for the REA metrics data and to be used as exemplars by university and government of positive engagement.

The results of the pilot study, along with additional input from the original Steering Committee, have made it possible to further refine the REA Metrics. As a result of the pilot study, we are now confident that we can collect the income from 'industry and other end users of the research, and commercialisation income', which provide the numerator for the metrics. The denominators described in the March 2015 report as 'M2' (share of national engagement) and 'M3' (research intensiveness) are to be used to determine a single REA Index for the universities contributing to each two digit field of research (FoR). An expert panel can then assess the distribution of the REA Index for each FoR, and, informed by the context provided by the vignettes and the information from 'M1' (engagement per FTE), determine cut-offs for universities in that FoR to be awarded an 'A' (well above national average for engagement), 'B' (above national average for engagement), or 'C' (below national average for engagement).

The REA Index would be published and provided for each FoR to the relevant university, along the data for M1, which may be a useful management tool for universities, faculties and departments.

From our extensive consultation on the engagement metrics, ATSE is confident that the publication of the REA results will drive behaviour towards increased engagement. Given the result of the REA Pilot, it is feasible for the REA to be deployed as a priority. While ATSE had not in its reports linked REA results to funding, it is very supportive of recommendations 19 to 23 of the *Review of Research Policy and Funding Arrangements* delivered by Dr Ian Watt in November 2015. However, ATSE remains strongly of the view that, while there is very strong support for the proposed changes to the funding formulas for the Research Block Grant allocation, it needs to be remembered that such block grant allocation is based on a whole-of-university formula that is not particularly visible to those outside the higher levels of university management. The proposal to publish ratings for the ATSE Engagement Metric (REA) in each field of research alongside the corresponding ERA results will allow it to become a very visible indicator that will be an effective management tool and a key modifier of behaviour.

Key Findings

> The ATSE engagement metrics, Research Engagement for Australia (REA), have had sufficient development and piloting to be trialled nationally as a measure of research collaboration and as a forward proxy for research impact.
> The REA metrics can be introduced primarily using data collected and reported by universities as part of their HERDC and ERA returns, with minimal administrative burden to collect additional data.
> The metrics could be trialled rapidly as a relatively low cost indicator of research collaboration.

Recommendations

> A national trial of the ATSE engagement metrics should be conducted in 2016, using ERA 2015 data provided with the agreement of university Vice Chancellors.
> The results from the national trial should be published alongside ERA results to provide a measure of research engagement that is complementary to the measure of research excellence (ERA). The trial results will be useful in guiding the ARC's exercise to establish a national measure of research engagement.

Methodology

> The metrics would compare performance at the two digit Field of Research (FoR) code level across Australian universities (Units of Evaluation), so that comparisons are within disciplines.
> The numerator of the metrics would be the total external research dollars attracted at the two digit FoR level from industry and other end users of the research, plus research commercialisation income.
> Three denominators would be used to calculate three metrics for each FoR:
    – M1 (research per FTE) – denominator is the total FTE contributing to the research;
    – M2 (share of national engagement) – denominator is the total national income for the given FoR; and
    – M3 (engagement intensiveness) – denominator is the university's total revenue from continuing operations.
> Each set of REA metrics would be accompanied by data on the percentage of the numerator that is contributed by research partners and the percentage from commercialisation.
> Each university would given the option of submitting a limited number of short vignettes explaining the activity behind a particularly strong or weak REA return.
> Expert panel(s) would use results from M2 and M3, contextualised by M1 data, percentage commercialisation and the vignettes, to determine an REA rating for each UoE. The distribution of ratings may include:
    – 'A' – well above the national median for that particular FoR;
    – 'B' – above the national median; and
    – 'C' – below the national median.
> The number of bands used would be determined by the panel(s), i.e. if all UoEs show similar performance, only 'B' ratings would be awarded.

Summary - Research Engagement for Australia

Background

The Australian Academy of Technology and Engineering (ATSE) believes that realising the benefits of Australia's world-class research system requires translation of its outputs into economic and societal benefits. The effective translation of research will be at the core of Australia's future competitiveness and prosperity. Australia undertakes world-class scientific research through universities and other publicly funded research organisations, such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO), the Australian Nuclear Science and Technology Organisation (ANSTO) and the Australian Institute of Marine Science (AIMS).

In the Australian university sector, there are effective financial and prestige incentives that focus researchers on producing high quality publications. Excellence in Research for Australia (ERA) encourages a focus on research publication by evaluating research using indicators such as peer review and citation metrics. The Department of Education and Training rewards this by allocating approximately $77 million per annum based on ERA outcomes through the Research Block Grants (RBG). The behaviours that ERA drives in our university sector have been even greater than might be anticipated from this relatively small amount of funding, demonstrating that a metrics-based approach can achieve important behavioural change.[1]

While research excellence is desirable in its own right, it is not a sufficient driver of innovation and is only one dimension of the research endeavour. A focus on research excellence is often at the expense of other important activities such as university collaborations with the private and public sectors, entrepreneurial behaviour and knowledge transfer.[2]

Indeed, OECD data show that Australian universities and publicly funded research institutes and industry in Australia are less engaged in collaboration than their counterparts in other countries. This is of particular concern for Australia given around 58 per cent of our researchers are employed in the higher education sector.[3]

Calls to address this have increasingly been heard from government and industry. As outlined in *Boosting the Commercial Returns from Research*, research translation is a key aspect of the Government's Industry, Innovation and Competitiveness Agenda:

> *Better translation of research into commercial outcomes is a key part of this [agenda] and will help drive innovation in Australia, grow successful Australian businesses and research capacity, and boost productivity and exports. It aligns with the Government's measures to reform the higher education sector and to realise the potential of health and other research.[4]*

An important step in achieving this is to "improve assessment of the research system, including improved metrics on engagement and knowledge transfer with industry, as well as research outcomes and impact."[5]

These sentiments are reinforced by the outcomes of the recent Review of Research Policy and Funding Arrangements, undertaken by Dr Ian Watt AO[6] and the Government's National Innovation and Science Agenda (NISA).[7] The NISA has committed the Government to produce measures of non-academic impact and engagement.

This project, undertaken by ATSE, explores options for developing such metrics, to measure Australian universities' research engagement with private and public sector partners.

This work is intended to ensure that research engagement is appropriately recognised and rewarded alongside research excellence, in line with the Government's National Innovation and Science Agenda. The proposed metrics are intended to work in parallel with ERA and do not imply a loss of the value of basic, curiosity-driven research. It is hoped that such research engagement metrics will help to increase the return on the public investment in research in science, technology, engineering and maths (STEM),medical and health sciences (MHS) and humanities and social sciences (HASS) alike.

Research engagement defined

Much of the policy discussion in Australia around maximising the benefits of publicly funded research, and in particular university based research, has focussed on measuring research impact. Broadly defined, 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."[8] This approach is focussed on the late stages of a research process.

Research engagement, by contrast, is defined as follows:

> *Engagement describes 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.[9]*

Policies focussed on research impact are limited by methodological difficulties around the attribution of impacts, establishing causal links between research and broader impacts, and the long time lags involved in research achieving impacts. Developing relevant and scalable metrics for assessing impact has thus remained elusive.

By contrast, metrics measuring earlier stages of a research engagement process are easily identifiable, broadly common across disciplines and readily available. Data on funding from partner organisations, and activities such as joint research projects with private and public sector partners, for example, are already collected or held by governments for a range of other purposes.

1 See ACIL Allen, 'Benefits Realisation Review of Excellence in Research for Australia'.

2 ACOLA, pp74-75.

3 OECD, p99.

4 Australian Government, p2.

5 Ibid, p24.

6 Watt, 2015

7 http://www.innovation.gov.au/

8 Publicly Funded Research Agencies (PFRA).

9 Ibid.

Implicit in these types of measures are two forms of research engagement – knowledge transfer; and collaboration. Knowledge transfer is understood to be "deliberately embedding knowledge for use in a context beyond the researcher's own sphere"; collaboration is understood as "researchers and research organisations engaging with other researchers and research organisations for mutual support and contribution to the conduct of research."[10] In this project, knowledge transfer and collaboration have been considered within the definition of research engagement i.e. knowledge transfer and collaboration are only considered where they occur between universities and the public (community) and/or private (industry) sectors. It should be noted that there are a range of important engagement activities undertaken in universities that are not being captured under this definition which relate to, for example, educational activities and broad community engagement. The aim of these definitions is to separate out research engagement from other important but distinct engagement activities. In this respect, the definition of research from the Higher Education Research Data Collection (HERDC) should be taken as implied throughout.

Use of existing data collections

In this exercise, the external dollars attracted into a research activity are used as a direct measure of research engagement. The decision to use income attracted in the metric was based on the fact that such amounts are accurately identifiable, quantifiable and audited; are already collected in a number of existing datasets, and; in attracting such funding, generally indicates that the funding company or organisation has conducted some type of merit or needs review in awarding the money.

A number of data sources were evaluated for inclusion in this project. Balancing the following considerations was foremost in identifying data:
> Data should be able to derive metrics that are relevant to different disciplines at the two digit field of research (FoR) level;
> Care should be given to minimise creating additional reporting requirements and additional costs for the higher education sector.

Two existing collections were primarily considered for the current project: HERDC and ERA.

The Higher Education Research Data Collection (HERDC) is an annual data collection administered by the Department of Education and Training. It collects data on research publications, as well as research income across a number of categories. The Excellence in Research for Australia (ERA) initiative is Australia's national evaluation of university research quality, administered by the Australian Research Council (ARC).

Both the HERDC and ERA data collections have limitations that have implications for this project, eg the HERDC data is not broken down into the various Fields of Research (FoRs).

One of the aims of the project was to ensure that it would be a relatively simple matter for the universities to obtain the data needed for the REA metric determination from these data-sets, along with other financial data held by the universities. This was confirmed in the pilot study carried out in the second phase of the project.

Comparison within disciplines

The ability to compare results on a discipline by discipline basis is considered fundamental to developing REA.

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.

In this project, the Australia and New Zealand Standard Research Classification (ANZSRC) Field of Research (FoR) codes were used, where each metric is applied to two-digit research disciplines (e.g. Mathematical Sciences – FoR 01. There are 22 two-digit Fields of Research in the ANZSRC classification, which cover all the research carried out in Australian universities. The ERA exercise compares fields of research at the four-digit as well as at the two-digit level. The two-digit level was chosen for the REA exercise because in some four-digit levels there are only a small number of universities that are evaluated, and the data for research engagement are not well distributed at the four-digit level. The two-digit level sums all the four digit data for that discipline, resulting in smoother data sets. For the initial phases of the REA exercise, the ARC supplied de-identified ERA 2012 data under strict privacy provisions. For the pilot study, the participating universities supplied data from their 2012 and, in the case of the Queensland universities 2015, ERA submissions.

Selection of inputs to use in the numerator of the metric

External dollars attracted from industry and other end-users into a research activity are used as a direct measure of research engagement.

The total external dollars attracted into each two-digit research discipline were determined from the following data obtained from the HERDC and ERA returns for the institution and used as the numerator of the metric:
> Major HERDC Category 1 Income that include a non-university partner contribution (including ARC Linkage Grants, NHMRC Development Grants and NHMRC Partnership Grants) where external partner income was included but not Commonwealth Government contributions;
> Other public sector income (HERDC Category 2), where government monies are contracts supporting a research activity;
> Industry and other income (HERDC Category 3, sub-categories 'Australian', 'International A' and 'International B'). 'HDR fees for domestic students' has been excluded from 'Australia' and sub-category 'International C: HDR fees for international students' has also been excluded;
> CRC Income (HERDC Category 4), excluding Commonwealth support);
> Research commercialisation income, supplied in the ERA returns;
> Non-government contributions to the funding received from Rural R&D Corporations (HERDC Cat 1)*; and
> Extension activities income that can be linked to a particular research project or output*.

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10   Ibid.

*During the course of the Pilot, a mechanism was developed to allow the private sector contributions to Rural R&D Corporation funding to be estimated and included in the metric determination. The Pilot also found that a number of universities obtain income from extension activities based on research from these institutions. Such amounts are not collected in annual HERDC returns, and a modification to the HERDC definition of research is proposed which would allow these monies to be included in the REA determination. These funds have now been added to the REA calculation.

Selection of inputs to use in the denominator of the metric

There was considerable discussion as to what would be the most appropriate data to use as the denominator of the metric. Various options were proposed and three final denominators were agreed, each of which captured a distinct dimension of research engagement activity (with the numerator remaining the same). The three denominators are intended to compare performance, in a given two-digit discipline, on productivity (M1), share of national engagement activity (M2) and the focus or intensiveness of a university in that discipline (M3).

The three metrics are:

M1: Engagement per FTE -Total relevant income in the UoE[11] divided by the number of full time equivalent staff (FTE) contributing to the UoE. FTE data was obtained from ERA2012.

M2: Share of national engagement activity – Total relevant income in the UoE divided by the sum of all the inputs nationally from universities submitting data in the same FoR.

M3: Engagement intensiveness – Total relevant income in the UoE divide by the university's 'Total revenue from Continuing Operations.'

University revenue data has been taken from the Department of Education and Training's *Financial Reports of Higher Education Providers* collection.

A worked example is included below for clarification of the method used in determining M1- Engagement per FTE for 'University of X' in 'Mathematical Sciences', FoR Code 01.

In Engagement per FTE, the sum of the inputs for a UoE is divided by the sum of the FTE for the same UoE.

The resulting figure is the total amount of relevant income per FTE in a two-digit discipline in a university. This provides a productivity measure that is adjusted for the number of FTE in a discipline in a university, and that can be compared within disciplines.

For example, in Mathematical Sciences (FoR code 01) 'University of X' has $250,000 of ARC Linkage grants (Relevant Category 1), $40,000 Other public sector income (Category 2), $120,000 of Industry and other income (Category 3), $20,000 of CRC income (Category 4) and $10,000 of Research Commercialisation income for a total of $440,000. There are 20 research active FTE in Mathematical Sciences at 'University of X.' The total is divided by the FTE, which results in a metric of $22,000.

Comparison of REA metrics and ERA ratings

As part of the first phase of developing REA, an analysis was conducted to compare the results obtained from the REA metrics with ERA ratings. Although this showed a correlation between the two, the analysis showed that the distributions of the REA metrics were different to those for ERA ratings, indicating that the engagement metrics were identifying collaborative activities in the university sector that are not distinguished by existing measures of research excellence (ERA).

Areas assessed to have high end-user engagement scores predominantly had high ERA excellence scores, while areas with low ERA scores rarely had high engagement scores. Importantly, there were many cases of high ERA ratings without strong engagement, but also cases of mid-range ERA ratings that showed strong engagement. The bulk of the highest ranking areas for engagement scored ERA 4 and 5. In other words, research excellence is an important, but not sufficient, condition for collaboration and innovation.

Calculation

$$\frac{Relevant\ Category\ 1_{UoE} + Category\ 2_{UoE} + Category\ 3_{UoE} + Category\ 4_{UoE} + Commercialisation\ income_{UoE}}{FTE_{UoE}}$$

Research Engagement for Australia Pilot Study

Between April and October 2015, with the support of the South Australian and Queensland State Governments, ATSE undertook a Pilot of REA, with the objective of demonstrating its feasibility as a robust, intuitive and low cost approach to measuring research engagement. The following section summarises work completed on the REA Pilot in collaboration with universities in Queensland and South Australia. This includes details of the REA metrics that were refined as a result of the REA Pilot, a summary of how the trial was conducted, and a discussion of the REA Pilot outcomes.

Participating universities

The REA Pilot involved working with the universities of South Australia and Queensland. All universities from the two states participated in the REA Pilot, including:

Queensland
> Bond University
> Central Queensland University
> Griffith University
> James Cook University
> Queensland University of Technology
> The University of Queensland
> The University of Southern Queensland
> The University of the Sunshine Coast

South Australia
> Flinders University
> The University of Adelaide
> The University of South Australia

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11   UoE (Unit of Evaluation) is a university's submission for a particular Field of Research (FoR).

Conducting the REA Pilot

Each university was asked to provide the relevant data from their ERA 2012 (and in the case of Queensland universities, ERA 2012 and 2015) submissions. This included the financial data required as inputs into the REA metrics, along with corresponding FTE data. Additional data was sourced from publicly available data, such as revenue data from the Department of Education and Training's *Financial Reports of Higher Education Providers* collection.

One of the primary aims of conducting the REA Pilot was to confirm that the approach of re-purposing existing data collections within the universities was a time- and cost-effective approach to measuring research engagement. This was confirmed – overall, universities were able to easily and quickly participate in the data provision, making use of the existing systems in support of other internal and external reporting requirements such as ERA and HERDC. In a small number of cases, ongoing resourcing requirements meant that staff were not available to provide the data in the required format in the given timeframes. In these cases, ATSE was able to instead seek permissions from the university to work with the ARC on providing the data directly from the ARC IT platform used in support of ERA, the System to Evaluate the Excellence of Research (SEER). This proved a useful approach in such cases, and directly receiving data from the ARC may be a useful process for future implementation of REA.

Findings of the REA Pilot

The REA Pilot demonstrated that the compliance burden for universities to provide data for the REA metric is minimal, and the decision to make use of existing data collections and university systems provides a quick and resource-light approach to obtaining research engagement data.

It was demonstrated that it is a relatively simple matter for the universities to identify only end user income in certain categories, for example Category 1 grants such as ARC Linkage and NHMRC Development grants, and Category 4 CRC income.

During the REA Pilot, participating universities were invited to comment on the results calculated for their assessed UoEs. In order to compare the performance across different disciplines, national averages were derived. The performance of participating universities was compared against this benchmark to assist with identifying strong performance on one or more of the metrics. Importantly, this allowed for a number of elements of REA performance to be verified in consultation with the universities, including that:

> strong REA performance relates to ongoing research engagement activities within the university in a given two-digit discipline;
> REA performance broadly meets the expectations of the university in terms of their perceived areas of strong research engagement;
> REA measures aspects of research activity that are not rewarded through existing measures, such as ERA.

Enhancements to the REA approach

The Pilot also produced a number of suggestions for improving and refining the metrics.

Introducing small, explanatory vignettes

In ERA, and consequently in REA, there are no restrictions on which FoR codes financial data can be assigned to by a university. It is possible for institutions to code research income to FoRs that are separate from the researchers who have been awarded the income and from the outputs that are related to that income. This means that there is a pressing need to verify that performance in REA is related to real research engagement activities in a particular discipline within a university.

This should not take the form of an auditing exercise – detailed auditing of the financial activities of universities is undertaken as part of universities' ongoing tax obligations to State, Territory and Commonwealth governments; in addition Category 1-4 income are independently audited as part of the annual HERDC collection. What is required, rather, is verification that the allocation of FoR codes to research engagement income used in REA corresponds to research activities in that discipline, and has not been strategically assigned to an FoR to artificially inflate performance.

In order to do this, it is proposed that universities provide a short written vignette or narrative for a small sample of the UoEs evaluated under REA. To avoid creating a new reporting burden, it is proposed that this be restricted to a sample of the highest performing UoEs nationally in each discipline. In other words, where a university has performed exceptionally well in REA in a given discipline (perhaps in the top one or two universities for the discipline), a short vignette will be provided explaining how the income included in that FoR relates to underlying research engagement activities.

In addition to providing a verification function, vignettes could also be submitted by universities in a limited number of UoEs to help document engagement that has not been captured by the income-based metrics, and where the REA metrics would be expected to underestimate engagement. This modification would allow universities to better represent research engagement activities that occur without the provision of external income (e.g. in-kind activities).

Identifying respective contributions from engagement and commercialisation in the metric

The results of the REA Pilot indicate that research engagement can take different forms at different institutions, and that research engagement spans a continuum from research partner income to commercial and other applications. More often than not universities are involved in both activities, generating commercial revenue and deriving revenue from research partnerships with end-users. However, in some cases, the returns from commercialisation activities can far exceed the value of contracted research and consultancies, or vice-versa. It is useful to be able to identify cases where REA performance of a university in a particular discipline is driven in large part or entirely by one or the other engagement activities. Supporting the dual contribution of universities in meeting the needs of today's industries as well as developing the industries of the future is an important anticipated outcome of REA. To assist in identifying the different types of activity underlying REA performance, an additional contextual indicator is proposed: an indicator showing the proportional contribution of commercialisation and engagement income for each UoE.

Table 1 Example REA Metrics for University X including new contextual indicator

University X	M1	M2	M3	Engagement income from research partners (%)	Engagement income from research commercialisation (%)
01 - Mathematical Sciences	$ 813,177	22%	4%	11%	89%
02 - Physical Sciences	Not assessed	Not assessed	Not assessed	Not assessed	Not assessed
03 - Chemical Science	$ 335,956	9%	2%	99%	1%

Table 1 includes example calculated REA Metrics for 'University X' in FoR '01 Mathematical Sciences', '02 – Physical Sciences' and '03 – Chemical Sciences'. Displayed in the final two columns is a breakdown of the numerator i.e. the relative contribution of the Category 1-4 (Engagement income from research partners) and commercialisation income (Engagement income from commercialisation) to its performance in each FoR.

In **Table 1** there are two distinct performance profiles. In '01 – Mathematical Sciences' the university has earned mostly commercialisation income (89 per cent) and so the performance on the REA Metrics is driven primarily by engagement income derived from commercialisation activities. In contrast, the performance in '03 – Chemical Sciences' is driven almost entirely by research engagement income from research partners (the relevant Category 1-4 inputs). This additional indicator provides useful context identifying the divergent performance profiles, and assists in interpreting the results of the REA Metrics. It provides policy-makers, universities and other stakeholders (including potential end-users) the ability to identify the different underlying processes and structures that are being measured in REA performance.

Introduction of panel(s) and assignment of ratings

The introduction of ERA in 2008 has demonstrated the effectiveness of a metric-based approach in driving behavioural changes.

In ERA, expert panels are convened on a discipline-by-discipline basis to provide a process of expert review and peer evaluation. Such arrangements would not be necessary for REA.

Instead, small panel(s) of experts trained in the REA methodology and underlying data could bring expert judgement to bear on the final allocation of ratings. This would involve analysing and verifying the REA Metrics, the underlying data, and the additional contextual information, including the explanatory vignettes.

The expert panel(s) would use results from M2 and M3, contextualised by M1 data, engagement income derived from commercialisation versus partners, and the vignettes, to determine an REA rating for each UoE. The distribution of ratings may include:
> 'A' – well above the national median for that particular FoR
> 'B' – above the national median
> 'C' – below the national median

The number of bands used would be determined by the panel(s), i.e. if all UoEs show similar performance, only 'B' ratings would be awarded.

Conclusion

The REA Pilot has confirmed that REA is a cost-effective and robust measure of research engagement: universities were able participate in the data provisions with minimal resourcing burdens, making use of the existing systems in support of other internal and external reporting requirements such as ERA and HERDC. The results of the REA Pilot, provided to universities, provided an intuitive and believable method of measuring research engagement. Strong REA performance was related to ongoing research engagement activities within the university and broadly accorded with the expectations of the university in terms of their perceived areas of strong research engagement. In addition, the REA Pilot confirmed earlier findings that REA measures aspects of research activity that are not captured through existing measures, such as ERA.

From our extensive consultation on the engagement metrics, ATSE is confident that the publication of the REA results will drive behaviour towards increased engagement. Given the result of the REA Pilot, it is feasible for the REA to be deployed as a priority. The proposal to publish ratings for the ATSE Engagement Metric (REA) in each field of research alongside the corresponding ERA results will allow it to become a very visible indicator that will be an effective management tool and a key modifier of behaviour.

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