



**Response to**  
**Assessing the wider benefits arising from university-based research**  
**discussion paper**

**by**

**The Australian Academy of Technological Sciences and Engineering**  
**(ATSE)**

**to**

**Department of Industry, Innovation, Climate Change, Science, Research**  
**and Tertiary Education**  
**Australian Government**

**August 2013**

## Assessing the wider benefits arising from university-based research

The Australian Academy of Technological Sciences and Engineering<sup>1</sup> (ATSE) welcomes the opportunity to respond to the Discussion Paper.

### **Introduction**

ATSE strongly endorses the determination of the benefits arising from university-based research and believes that the ultimate publication of the results of a survey of research impact will assist the public perception of university research, as well as providing the public sector and industry with guidance as to which universities are fostering a research culture in which uptake of research findings is considered important. A focus on the benefits arising from university-based research will also develop a virtuous circle by firstly encouraging academic staff to be engaged in these activities and secondly, these staff will, both by example and by their undergraduate and postgraduate teaching, encourage their students to be engaged in these activities post graduation. Further, it is essential to demonstrate to key stakeholders the dividends arising from Australia's investment in research. While ATSE has a particular interest in university research in a range of Fields of Research<sup>2</sup> (which are related to the application of science and technology), and its response is couched in these terms, it acknowledges the importance of the application of research in fields other than these.

### **1. Introduction**

*Please provide any comments you have in relation to the issues raised in Part 1 of the paper, addressing if possible the following questions raised in Section 1.5:*

- *How might the above definitions be improved or supplemented?*
- *Are these definitions sufficient to describe the relationship between research, research engagement and benefits?*

The definition of “benefits” of research provided in the Discussion Paper is very broad and the reference to pages 5-11 of the National Research Investment Plan while useful in giving illustrative case studies does not provide a more precise definition of what the Government wishes to examine as “benefits” in the proposed pilot study. In line with the Government's rhetoric on the need for innovation as a key element in raising Australia's productivity, ATSE feels that it would be useful to define the information sought as that “associated with a key innovation” as the term “innovation” is now widely understood and embodies the concept of quality research having been put to use. Recognition is already afforded to research breakthroughs in the research media and translates into ERA rankings. Recognition of significant innovation arising from university research remains a poorly served area.

<sup>1</sup> ATSE was established in 1975 with the mission to promote the application of scientific and engineering knowledge to the future benefit of Australia. ATSE is one of four learned national Academies, which have complementary roles and work together both nationally and internationally. ATSE has some 800 elected Fellows who are the leaders of applied science and engineering across the country.

<sup>2</sup> FORs (2-digit) 04 Earth Sciences, 05 Environmental Sciences, 07 Agricultural and Veterinary Sciences, 08 Information and Computer Sciences, 09 Engineering, 10 Technology, 11 Medical and Health Sciences (primarily 1115 Pharmacology and Pharmaceutical Sciences).

For most research which leads to innovation ATSE believes it is possible to express the notional benefit in dollar terms. This would be the approach used in the private sector and the assigning of a potential dollar value to the innovations from specific research would provide a basis for comparison. Possibly the definition of benefits should include a notion of the financial contribution of the research to the ongoing Australian economy.

A further consideration relates to the overall beneficiary of the benefits. Should the beneficiary be defined as the Australian community generally? If worthy research is solely exploited in foreign jurisdictions there seems little long-term benefit to Australia unless there are opportunities for Australia to gain financially or reputationally from the event.

The second paragraph of “Benefits” could be taken as training researchers who move outside the university taking their skills and knowledge with them. If this is the intention it could add a whole new level of complexity to the evaluation. It would be less ambiguous if the statement is confined to – ‘Benefits do not include changes to the body of academic knowledge’. This said, it is well recognised internationally that students taught by academic staff who have been successful in having their high-impact research adopted by industry leave for careers in industry that are influenced by their recognition of the importance of innovation in raising the fortunes of their company. Graduates from MIT and Imperial College, London, would be excellent examples of this phenomenon. Can Australian universities be encouraged to emulate this?

With respect to “research engagement” possible consideration should be given to differentiation between “researcher push” and “user pull” types of research. Frequently the former is driven by creating an opportunity and the latter by solving a problem. The present definition reflects the traditional linear model of university research leading directly to innovation, which has now been replaced by diffuse models such as open research by industry which seeks more direct interaction with universities at the time research directions are formulated. Impact assessment as a result requires different approaches to be adopted as uptake is far more secure if a defined problem can be solved. The evaluation process needs to ensure researchers are not discouraged from more blue-sky type research, where at the outset, the path to uptake might not be immediately apparent.

In OECD terms, Australia has a relatively poor record of university-industry research collaboration and in the Discussion Paper it is indicated that the Government wishes the current initiative to foster this. Accordingly, the definition of research engagement should place greater emphasis on the extent of research collaboration with industry that is fostered within an institution. Manifestations of such collaboration include success in obtaining ARC Linkage Grants, participation in CRCS, grants from industry to conduct research and joint patents. By highlighting collaboration as an important component of research engagement, high impact research that has fostered such collaboration will be adequately recognised.

## 2. Aims, outcomes and principles

*Please provide any comments you have in relation to the issues raised in Part 2 of the paper, addressing if possible the following questions raised in Sections 2.1, 2.2, and 2.3:*

- *Are there alternative or additional aims that should be included?*
- *Are there additional purposes or uses that should be considered to assist the design of the assessment?*

*What are your views on the draft principles? What other principles or considerations should be addressed?*

## **Aims**

ATSE supports the proposed aims of the exercise. It would suggest the inclusion of two additional aims, namely:

- 1) *“Provide a basis on which public-sector funding bodies (e.g. ARC, NHMRC, other research agencies) can assist universities in ensuring that appropriate research is taken through to ensure public benefits”.*

Agency funding policies and documentation are presently largely silent on this aspect. For example, in requiring a description of the project, ARC does not focus on assessing the public benefits of its successful completion. Nor is there any assistance given to researchers in this direction or follow-up to see that proposed benefits have been realised. This is in marked contrast to research funding programs in the USA (NSF and Defence Force) where follow-up on benefits is stringent.

- 2) *“Increase investment in university research from sources outside of traditional funding mechanisms”*

A process that identifies which university research groups are the most successful in having their work give rise to beneficial outcomes will inevitably be used as a reference by external organisations looking for opportunities to fund research which could enhance their own activities. One of the limitations on more industry funding of university research is the lack of information of where relevant high quality researchers are located.

Interpretation of the meaning of the present aims is important. For example:

Public Benefits: Public benefits must be widely interpreted. Privately captured benefits are valuable and inevitably have secondary spill-over effects ranging from increased tax revenue and employment through to downstream benefits from new/improved products, services, standards, regulations etc.

Pathways to Benefits: Here it is noted that these are fast changing as industry adapts to a changing world environment and government stimulus programs emerge or are truncated. Offshore experiences suggest that Australia still has a way to go in developing government stimulus programs to foster collaboration and uptake of innovation. Australia is amongst the lowest ranked of the OECD group of nations in collaborative university-industry research.

Culture and Practice Within Universities: This is much wider than the encouragement and support of collaborative research ventures and routes to commercialisation. It must take into account guidance provided within institutions for appointments and promotions and terms of reference for interaction with outside bodies.

Included with Aim 2.1.4 should be the identification and publicising of areas of university research strengths with a good track record for having research outputs taken up, so that potential users can identify the best collaborators.

## Outcomes

The proposed outcomes are supported. However, some modification is suggested:

### Additional dot points:

- providing governments (State and Commonwealth) with a basis on which to develop policy to better capture the benefits of university research
- providing the private sector within Australia a basis on which to engage with specific universities or research groups to maximise the likelihood of beneficial outcomes from supported or collaborative research

## Principles

The principles are sound though they imply that the whole process is university driven. Suggested modifications are:

Principle 1: Extending Principle 1 to “*Provide useful information to universities and research end users*” which would be consistent with the other principles.

Principle 5: To be useful Principle 5 would preferably be expressed as “*Collect and assess at the institution discipline level with some aggregation by discipline*”. Universities cannot be good at everything and should be encouraged to build on their strengths rather than having them disguised by averaging out all their activities. Potential research users are more interested in identifying the best groups to collaborate with, not necessarily the universities having the highest research impacts overall.

With respect to Principle 3, it is noted that the culture of researcher behaviour in universities is much driven by existing policies within the institution, especially by appointment and promotion policies. For example, the advent of the ERA exercise has meant that many universities have focused on appointing and promoting academic staff whose strength is publication in prestigious journals rather than those who, by reason of background or inclination, are likely to collaborate in their research with the private sector and to focus on national benefits from their research. Without any great administrative burden, universities could, as part of the data set for the “benefits” exercise, be asked to submit copies of their policies on appointments and promotion and any explicit advice given to researchers on the importance of capturing public benefits from their research.

A further Principle that perhaps should be made explicit is the question of research quality. This was a feature of the ATN/Go8 trial and created some difficulty in assessment. Often high impacts are achieved by poorly designed and executed research, while elegantly designed research can yield poor results. Similarly there are instances where intricately performed experimentation can result in less than a simple mass processing and analysis of existing data. Both the UK exercise and the discontinued RQF initiative grappled with this challenge. In the case of the RQF the implementation group recommended that the research underlying a project submitted for assessment be at least at category 3 standard.

Finally, it is noted that one possibly perverse outcome of the UK HEFCE exercises has been additional funding for the strengthening of the commercialisation companies of UK universities. This suggests government policy based on the traditional linear “researcher push” model. By contrast, Australian researchers should, by reason of the smaller spectrum of research able to be covered, be more greatly influenced by “user pull”. In the

manufacturing and services sectors the nation is known for its strength in adapting overseas technology to innovative local goals. This should be a priority in the benefit assessment process and the developments it spawns.

### 3. Methodological considerations

*Please provide any comments you have in relation to the issues raised in Part 3 of the paper, addressing if possible the following questions on research engagement metrics, research benefit case studies, and use of collected information.*

#### Research engagement metrics

- **What considerations should guide the inclusion of metrics within the assessment?**

While metrics can provide a snapshot of an institution's current functioning (as they do in the ERA process), they may fail to give an accurate guide to the present culture within a university and those factors that have led to significant research benefits to the nation having been realised. Past research management policies may have accorded particular areas of research strong support by selective funding from block grants, may have favoured the support of Co-operative Research Centres (CRC), or may have actively canvassed support from industry. An institution's approach and processes may have markedly changed in the possible 15 years it may take to bring a research development through to a financially beneficial innovation. Its overall research fortunes as a recipient of National Competitive Grants may have waxed or waned. But what is likely to be measured using metrics alone is recent events because of the administrative burden of garnering data and institutional attitudes over a prolonged period. Current metrics must therefore be regarded as, at best, a crude measure of an institution's capabilities in fostering nationally beneficial research and may not correlate well with current beneficial outcomes.

- **What are the lead indicators for research benefits?**

It is difficult to see how a single set of engagement metrics can be used to assess research which has an impact outside academia. The problem is that there are multiple pathways to impact and each might need different metrics. A non-exhaustive listing of pathways would include:

- Fully funded contract research
- Collaborative research with non-university partner(s) who provide the funding
- Research through a Centre funded externally, through ARC/NHMRC, through the university
- Research undertaken through a CRC
- Research undertaken funded by an ARC Linkage or NHMRC Development Grant
- Research for which no users are identified when it is initiated

For some of these the main metric would be the funding provided. For others, the statistics collected for the ERA would be a better measure. Perhaps the simplest metric is how much someone outside the system is prepared to invest in having the research performed.



- ***What information do universities currently collect that might form the basis for research engagement metrics?***

Most universities provide mechanisms for concentration of research effort into Centres. Such Centres are frequently the focus of research outreach and a convenient point at which external users of research may initiate contact. In many instances they become conduits for non-government external funding and can also target existing funding bodies for focussed research. In their research management many universities keep a careful watch on the functioning and effectiveness of such Centres, dis-establishing those that fail to meet targets. Asking universities to provide information about their Centres, the existence or otherwise of external Advisory Committees, and the fraction of Centres that are dis-established after rigorous review (all information presumably routinely available) - would be useful in assessing university research management protocols.

Other information that might be of interest are: the fraction of academic staff that have joined the university from the private sector (thus having private sector networks), and the proportion of staff taking study leave who choose to take this in the private sector. Having established links into the private sector markedly assists in ensuring the uptake of promising research or in the identification of potentially highly beneficial research projects.

- ***What metrics are currently available (or could be developed) that would help to reveal other pathways to research benefit?***

The Discussion Paper has not addressed the “user pull” side of the pathway question. Whilst it would be a daunting task to seek input from industry as a whole, especially the SME community, there is a very real possibility that industry associations could be willing to provide useful information in this regard. Symposia held by ATSE have shown that industry is very interested in markedly improving industry-university co-operation and has made useful suggestions on pathway improvements. Likewise the *Industry Innovation Councils* may be able to provide information on user-side attitudes and university competencies in facilitation of the capture of research benefits. A pathway to benefit would be deemed to be valued if there was an increase in time of external contributions or external contributors. A year-on-year increase in financial support is the clearest indicator that a pathway is successful. ATSE would be willing to work with ARC on seeking industry input for those areas where its Fellows are involved.

- ***Noting that the Higher Education Staff Data collection is currently being reviewed, are there any research engagement metrics related to university staff that should be considered for inclusion?***

As indicated, there would be benefit in getting information from universities on the proportion of staff appointed from the private sector and the proportion of staff taking Study Leave in the private sector. Another useful parameter would be staff secondments/exchanges between universities and industry (in both directions).

- ***In addition to ERA, NSRC, GDS, AusPat and HERDC data, are there other existing data collections that may be of relevance?***

Some breakdown by university in the information reported in these data may be appropriate for example:

- GDS: Proportion of graduates by graduating category who have gained employment in the private sector.
- AusPat: Proportion of patents by institution that are held with collaborators from the private sector.
- NCRIS/CRIS: Number of NCRIS facilities in the PSO respondent and, more importantly, the percentage of industry-related projects that each facility carries out.

- ***What are the challenges of using these data collections to assess research engagement?***

Much of the information being collected in this process has already been considered in the ERA ranking process. It is important that adequate weight be given to accounting for those components that are new and are specifically related to an institution's research and collaborative culture rather than just its research output in ranked journals and success in getting national competitive grants. Valuing in-kind contributions to research (private sector in-kind can be very important) can be a particular challenge.

- ***What is your preferred unit of evaluation for research engagement and why?***

Measures of collaboration such as success in ARC Linkage and NHMRC Development Grants, participation in CRCs, and research funding from the private sector are keys to eliciting the prospective external benefits of university research. Funding quantum and leverage achieved on university internal funding are critical factors. Reducing everything to a monetary value makes comparisons between different types of research and disciplines easier.

- ***What are the issues related to using FoR codes?***

Increasingly, research undertaken to achieve a beneficial outcome is interdisciplinary and collaborative so it becomes difficult to relate the research to a specific FOR code. The problem is perhaps less at the two-digit FOR level. Maintenance of an FOR categorisation makes comparison with the ERA exercise more straightforward but the primary assessment should be based on SEO categorisation as it ties the study to national economic indicators. A matrix approach using both SEO and FOR categorisations would seem the most appropriate.

- ***Is there a need to use four- or six- digit FoR codes or will the two-digit code suffice?***

Should it be seen necessary to maintain FORs, for the fields nominated by ATSE a two-digit approach would suffice, except in the case of FOR 11 where applied elements specific to the pharmaceutical industry (FOR 1115) are embedded.

- ***What are the opportunities and costs of breaking down analysis to the more detailed level?***

Given that ERA does break down its analysis into the four-digit level, it would not seem overly expensive to do this. Because Australian universities are customarily organised into faculties, and research policies to promote collaboration and uptake of research are developed at the faculty or institutional level, it may not be justified to process data at a more detailed level. However, as noted earlier, private sector organisation seeking research



collaboration frequently want to know details at the disciplinary level. Universities are best able to provide estimates of the costs involved.

- **Given an interest in “outcomes”, would it be better to use the ABS’s Socio-Economic Objectives for research (SEO) codes? Why/why not?**

There is strong attraction in using SEO codes as a primary classifier and, indeed, the ATN/Go8 trial made successful use of them. Devising a matrix approach using both SEO and FOR classifications might prove to be ideal.

- **Approach to metrics: What are the strengths and weaknesses of the model?**

The model seems adequate - providing it is possible to differentiate between the various possible pathways to uptake suggested above and if a matrix of FOR and SEO classifications used. Given the purpose of the exercise is to identify the most propitious methods for capturing research benefits and recognising that these may be discipline dependent, the information that the model provides should allow individual universities, in concert with end users, to develop policies for maximising capture of research benefits and the opportunity, over a period of time, to benchmark the effectiveness of these against other institutions.

### Research benefit case studies

- **What considerations should guide the inclusion of research benefit case studies within the assessment?**

Case studies chosen should represent research benefits that have led to direct benefits to the Australian economy. As a guide, a level of minimum realised benefits valued at \$50-100 million could be set. This figure would represent profits made in the private sector or notional savings to government. Return on research investment might also be considered a screening parameter.

Before a case study is prepared - ideally the proponents should be able to provide some quantification for one or more of the following:

- Plant breeder’s rights, patents, registered designs (as per ERA)
  - Research commercialisation income (as per ERA)
  - Licencing income
  - Cost savings arising in the hands of the user
  - Incremental revenue arising through application of the research
  - Additional investment made as a result of the research, including in start-up companies
  - Changes in environmental management practices arising from the research
  - Government policy changes made as a result of the research
  - Practice changes adopted by users resulting from the research
  - Other benefits arising not covered by the nominated categories
- **How should the number of case studies provided by each university be determined?**

There is a problem here in that there is a considerable backlog of possible case studies, so for the first round it might prove inequitable to artificially restrict their number. A university with a long history of external engagement would be penalised relative to more recently

established or less research intensive institutions. Perhaps a way of introducing some discipline is to set a total research investment threshold for the first round (say \$0.5M – although this might need to be varied by discipline) and then lower the threshold progressively as the backlog is reduced.

The value of the scheme would be undermined if all universities were allocated the same number of case studies as the aim should be to identify the research that has provided the greatest benefits regardless of where it was done.

- ***Are there any issues with institutions being able to submit joint case studies? If so, what are they?***

Realistically joint case studies need to be provided for, even encouraged. The issue arises if the assessment results are to be used for future funding decisions or construction of league tables. This problem needs to be resolved separately from developing a benefit/impact assessment scheme with the highest possible level of integrity. Perhaps, in submitting a joint case study, institutions should have to formally agree on the contribution to success that each has made.

- ***What information should be included within a case study?***

Elements to be included could cover:

- How the research was initiated.
- A brief summary of what was done and achieved.
- A brief summary of what the impact has been or is likely to be.
- The total budget for the research, the source of funding and if possible some estimate in money terms of its impact.
- An auditable statement on benefit/impact by an end user.

From the ATN/Go8 trial it was concluded that if assessment required the assessors to go to a web page or email a referee for key information, the process became impossible to manage; submissions need to be self-contained.

- ***How should a case study be assessed? Should it be scored or rated in some way?***

Assigning each application to a ranking band worked for the EIA trial and generally a high level of agreement was reached between the expert panel members. In an earlier submission to ARC, ATSE argued for three categories for ranking, but the use of five categories might better align the assessment with the approach used in the ERA initiative.

- ***Are reach and significance useful concepts for an assessment of the benefits arising from university-based research?***

These factors should be included in the guidelines for preparing the case study statement on impact. Where appropriate, a short statement on international comparisons would be helpful.

- ***What would make useful criteria for assessing the benefit of university research?***

An underlying attempt to translate benefits into monetary terms which can be compared with the costs incurred, would meet the basic aim of justifying the public expenditure on applied research. It is recognised that this will not always be possible and may discriminate against some types of research if taken too far.

- **Are there data/evidence collection standards that you consider best practice within the University research context?**

Similar standards as applied to the ERA exercise are appropriate. Identified users of research cited in case studies should formally verify claims made, with such verification held by the institution.

- **Is there data regularly collected by universities that could be employed to provide a picture of research benefits? If so, how is this information captured and validated?**

Data held at present by universities is mainly used to satisfy existing government requirements, though many universities regularly publish research highlights and the like which comment on the uptake of successful research. Validation of such information is difficult and is best handled through the case study approach.

- **Should timeframes be used to limit what is reported on through case studies? If so, what timeframe(s) should be used?**

Due to the backlog, the first round should allow case studies for which the majority of the research was done in the last (say) 15 years to be submitted. This would keep the present study compatible with that of HEFCE. Once the backlog is reduced this time could possibly be reduced, though it is recognised that research in many areas can take some considerable time to yield significant benefits.

- **What is your preferred unit of evaluation for the assessment of research benefits and why?**

SEO was satisfactory for the EIA trial and should be adopted. However, given that the research itself can best be categorised under the FOR system, a matrix approach of both SEO and FOR should be developed if possible i.e. examine the benefits under a SEO framework and categorise the research inputs under a FOR schema.

- **Approach to case studies: What are the strengths and weaknesses of the model?**

The model proposed for implementation of the case study approach is appropriate. It is suggested that two additional rationales should be included:

1) *'Allow potential research users to identify what research capacity exists in the universities and which universities have a history of providing useful outcomes.'*

2) *'Identify disciplinary groupings or Centres within universities that have a history of promoting beneficial research outcomes.'*

### Use of collected information

- **How might case studies and metrics be combined within the assessment?**

The model is satisfactory except an additional rationale should be included – 'Allow potential research users to identify what research capacity exists in the universities and which universities have a history of providing useful outcomes'. The end result should be a rating that is comparable to the ERA rating so should include both case study assessments and any relevant metrics. Combined assessment (option 4) is preferred.

- **Should outputs of the assessment be included within compacts and/or the research block grants calculation methodology?**

It should inform the nature of compacts with individual universities and be used in the calculation of research block grants. Additional funding should be provided to accelerate collaboration and the adoption within universities of policies that accelerate harvesting the benefits of research.

- **What other existing instruments might they be integrated within?**

Results should be able to inform the application assessment process for schemes such as ARC Linkage and NH&MRC Development and CRCs.

#### 4. Next steps in the consultation process

*Please provide any comments you have in relation to the issues raised in Part 4 of the paper, including on the proposed pilot exercise.*

The process outlined is appropriate. It needs to build on the ATN/Go8 EIA trial and in particular find some way to provide an incentive for the universities to dedicate resources to it. The EIA trial seemed to attract projects already well documented as the universities had little reason to expend too much effort.

ATSE would strongly encourage the significant involvement of research users from this point. It would encourage dialogue with the Australian Industry Research Group and industry associations. As ATSE has as its remit the application of science and technology, it is well placed to advise the government on the initiative and to play a lead role in garnering a response from industry.

#### 5. Other comments

*Please provide any other comments you have in relation to the discussion paper.*

The establishment of a scheme to evaluate the benefits or impacts of university research is needed urgently. Already the emphasis on publication is influencing priorities, recruitment, promotion and training policies; in the CRC reviews conducted this year the problem of the attention being placed on ERA indicators within university partners was regularly raised as a serious issue.

Experience with the ATN/Go8 EIA trial reduced concerns about the time delay between completion of research and determining its impact. In the same way as peer review requires an element of subjective judgement, an experienced expert panel appears able to reach consensus on potential benefits/impacts reasonably easily. This approach is seen as being needed in any case for some research into such things as handling results from epidemics, earthquakes, terrorism etc. which may never occur but nevertheless should still be encouraged and evaluated.

One issue that will need careful consideration is how any system will handle shared impacts, as the nature of applied research is that it is often undertaken collaboratively. Should the outputs of an evaluation system be used, for instance, to guide future recurrent funding or capital allocations, it could become a source of friction.

In choosing disciplinary areas for its pilot scale examination of the process, the government could do worse than focus on those areas embraced by ATSE.