

Appendix D—Summary of Questions

Section 3—Excellence in Research for Australia

ERA policy

Value of ERA

Q3.1 To what extent is ERA meeting its objectives to:

Continue to develop and maintain an evaluation framework that gives government, industry, business and the wider community assurance of the excellence of research conducted in Australian higher education institutions. *A very large amount; A large amount; A moderate amount; A small amount; Not at all.*

Please explain your answer.

A moderate amount.

a.

Digital Science is certainly supportive of the need for assessment and the underpinning principles, however now after four rounds, and 12 years following the original ERA exercise, we would welcome the opportunity to revisit the current setting and work collaboratively with the Australian ERA stakeholders to establish recommendations on how to improve the current returns experienced today and address some of the points below.

A recurring theme after each ERA round is news of gaming. Submissions are continually optimised for the best possible outcomes. While a certain amount of this behaviour is expected, optimisation is in the spirit of the ERA, whereas gaming is not and is an unintended but a difficult-to-avoid side-effect of evaluation. A possible way forward to meet the objective of Q3.1a in terms of future development, is for the ERA frameworks and methodologies to be reviewed such as making post submission data publicly available. Making data publicly available brings in check the institution's reputation versus optimisation. In addition, the use of new technologies and different approaches such as article-level classification with Dimensions would make the results publicly verifiable as Dimensions offers a [free version](#).

Technology has developed further. As stated in the Dimensions Data Guide¹, "Article-level indicators need to be paired with article-level classifications", NLP and machine learning are allowing categorisation approaches which take the substance into account. The fields of natural language processing, machine learning and artificial intelligence have all made huge advances in recent years. Dimensions has been able to leverage these technologies to solve a very practical problem requiring a different approach: If you want to consistently categorize grants, patents, clinical trials and policy documents, a journal proxy is no longer available. The path we

¹ Machine learning based research topic classification p4: Dimensions Data Guide: Herzog, Hook, McGrath - https://dimensions.figshare.com/articles/A_Guide_to_the_Dimensions_Data_Approach/5783094/7

have chosen for Dimensions is to use existing classification systems, as well as to develop new ones, using a machine-learning based approach to automatically assign a consistent set of categories to all documents – regardless of the source.

We implemented established research classification systems that have existing associated datasets that we are able to use to train our classification algorithms. The leading categorization system with broad coverage of subject areas and a large general corpus of training material is the Australia/New Zealand Fields of Research system. This classification “lens” has been made available as part of the free Dimensions version. Dimensions continues to evolve, having recently launched a classification scheme for the United Nations Sustainable Development Goals (SDGs) and also for the UK REF Units of Assessment. This demonstrates the flexibility of the technological and ontological approach taken by the Dimensions team, since the SDGs are highly interdisciplinary and hence challenging to classify.

Dimensions as a data source also includes other elements of the research cycle such as grants, patents, clinical trials, policy documents and datasets, which are classified at the object level in order to ensure homogeneity of analytical capability across different data/object types².

The provision of article-level classification via an automated engine such as Dimensions can reduce the administrative burden around assignment of FoRs as it can act as a guide to academics, administrators and assessors alike. It could also reduce the need for an ERA Journal list, which would be welcomed by those in the sector who feel that journal-level quality evaluation is an outdated mode. Dimensions is slowly helping to facilitate the empowerment of the research community, allowing them to create their own metrics and indicators that are more reflective of local needs and opinions. Employing a flexible article-level classification, unique persistent identifiers, and a transparently accessible platform that allows reproducible calculation of evaluation metrics is appealing to many.

Transparent evaluation methodologies may still be some way off, however, the technology and data to support an open methodology is finally being delivered. In the interests of all stakeholders, we believe that this is an aspiration that should ultimately be embraced by the whole sector.

- b. Provide a national stocktake of discipline-level areas of research strength and areas where there is opportunity for development in Australian higher education institutions. *A very large amount; A large amount; A moderate amount; A small amount; Not at all. Please explain your answer.*

² Hook, Porter, Herzog (2018) Dimensions: Building Context for Search and Evaluation, <https://doi.org/10.3389/frma.2018.00023>

Initially a large amount for the first round of ERA in 2010 now after the fourth round in 2018 a moderate amount.

When the first ERA assessment occurred in 2010 it surfaced a lot of information on research strengths in Australian institutions, and facilitated transparency of both national and internationally benchmarking.

Now, following the fourth round of ERA in 2018, disciplines where citation analysis is a prevalent evaluation technique, shows continued cross-sectoral improvement with more ERA 5 and ERA 4 ratings in 2018, compared with previous ERA rounds. Of course, it is open to interpretation as to whether this constitutes “grade inflation”, whether it indicates merely greater alignment of Australian research with international norms, an investment in “popular” topics or whether there is an actual objective increase in research quality. In any case, there is an opportunity to review current methodology and frameworks, in order to understand what constitutes an appropriate methodology for evaluation in Australia and whether current techniques remain well-aligned with Australia’s aspirations on the world stage - are the right things being measured in the right way?

For disciplines that employ peer review as their principal mode for evaluation, primarily for the Humanities, Arts and Social Sciences, an object assessment suggests that increase in research capability has not increased at the same rate as in STEM³. However, this may simply be due to the difference in methodologies employed. Citation cliques, normalisation and alignment to external benchmarks all play a role in numerically based analyses that are not present in peer-review based systems, which are less gameable. Level of investment also plays a key role in the capacity to change a field. If Australia wishes to have a stronger HASS reputation globally, then putting a framework in place that is able to support that ambition would be a key part of any re-evaluation at this stage.

- c. Identify excellence across the full spectrum of research performance. *A very large amount; A large amount; A moderate amount; A small amount; Not at all. Please explain your answer.*

A large amount. ERA is clearly successful at identifying research excellence by a given definition of that term.

We believe, however, that a broader and more inclusive definition of excellence may be an important tool in readying the Australian sector for future success in an increasingly globalised but potentially multi-faceted research setting.

³ Marnie Hughes-Warrington on why we don't need two ERAs - <https://campusmorningmail.com.au/news/teaching-and-research-belong-together-why-we-dont-need-two-eras/>

It may well be that the approach taken by HASS disciplines in Australia is not as unsuccessful as may be thought at first glance. Increasing quality in reproducibility of research, research ethics and other key standards are not explicitly reflected in citation-based metrics. Australian thinking in these areas is often ahead of global standards. However, the level of investment in hard sciences is often significantly higher than in HASS areas facilitating a different research profile. However, closer alignment to international norms (in order to perform better in international benchmarks) is not necessarily a positive trend. On a broader level, international trends are generally away from high investment in HASS areas and hence Australia may have a rare opportunity to turn this into a centrepiece of future research strategy. Other areas that are underrepresented globally but which we believe to be of steadily increasing importance are topics that relate to the UN's SDGs.

- d. Identify emerging research areas and opportunities for further development. *A very large amount; A large amount; A moderate amount; A small amount; Not at all. Please explain your answer.*

A small amount.

Emergent areas of research are often challenging to identify, nurture and support. Many emergent areas are interdisciplinary and the use both of FORs as a categorisation scheme and Journal Lists as guides for interdisciplinarity act as conservative constraints that make it difficult to recognise and prioritise research that crosses boundaries. The UK has recently introduced an Interdisciplinary Panel for REF 2021 to attempt to address precisely this type of challenge. However, while this is a solid start, a great deal more needs to change in order to the environmental challenges of interdisciplinarity that are intrinsic in research institution departmental structures as well as funding structures, not to mention career development opportunities. Parallels can be seen in the Australian system.

An approach needs to be found to creating greater emphasis on academic freedom at the boundaries of research fields such that high-risk research opportunities can be identified and developed in a way that protects career prospects, develops broader sectoral capabilities and crosses FOR-aligned funding and structural boundaries.

Transparent evaluation is a way to identify existing challenges and biases that may be inherent in a structure that is delineated by an established and well-defined discipline-based categorisation scheme.

There is a great deal of opportunity to analyse and assess the past four ERA rounds where further visualisations could surface the changes from one ERA round to another developing a time series. Digital Science would welcome further discussions on capabilities and options that could lead to further

discoveries on past ERA rounds as well as inform and provide recommendations for future ERA rounds.

- e. Allow for comparisons of research in Australia, nationally and internationally, for all discipline areas. *A very large amount; A large amount; A moderate amount; A small amount; Not at all. Please explain your answer.*

Initially for the first round of ERA, a large amount, now for the most recent ERA 2018 round, a moderate amount.

Each round has identified and compared research across disciplines in Australia both Nationally and Internationally. However, by 2008, it always already accepted that citation analysis was not a good proxy for quality. While this does make research globally comparable, it also incentivises behaviours that may not be ideal. Indeed, the rise of reports such as The Metric Tide in the UK, the Leiden Manifesto and movements such as DORA have all shown that the use of research metrics need to be kept in check. In the present day, artificial intelligence and automated article assessment threatens to create a new wave of injudicious technology choices that may affect the research landscape for decades to come. At the same time, over the last 12 years the discussion around quality has moved further and issues such as reproducibility of research and ethically responsible research have been constant themes. A more subtle view is required.

On 29 September 2020, Digital Science's Dimensions team announced a new module⁴, that gives a concrete route to increasing the diversity of data used to formulate indicators around research. While this is not a "silver bullet" for the issues outlined above, it is a conscious move away from a citation-dominated view of research to something that is more inclusive and representative of research endeavour.

- Q3.2 The ERA objectives are appropriate for meeting the future needs of its stakeholders. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Disagree.

As currently drafted we believe that the five ERA objectives are too narrowly defined to meet the future needs of a broad set of stakeholders. We recommend a review of the definition of "excellence" that is sensitive to a broader context of global needs and challenges that are reflective not only of societal, economic, political, technological and environmental challenges but which look beyond national borders to consider a global context that is increasingly missed by other countries. We also suggest that while it is understood that there are limits placed on the cost of evaluative mechanisms, they also need to move forward to be reflective of the nature of improved tools, and a wider view of what can be used to benchmark research quality.

⁴<https://www.digital-science.com/press-releases/dimensions-partners-with-google-cloud-and-launches-integration-with-bigquery/>

- a. If you disagreed with the previous statement, what should the primary purpose of ERA be going forward? *Please explain your answer.*

ERA needs to redefine itself to facilitate a more dynamic research context than was the case in 2008. The Australian sector has been extremely successful on the world stage, but the world has now moved on and Australia needs to look forward. In 2008, Open Access was not yet established as the future direction of research publication; broad data to measure research was not available; reproducibility was not a critical discussion. In the intervening 12 years research has become more data driven than ever; each of the issues and developments mentioned above has fundamentally shifted views. Research integrity, a discussion in which Australia leads the world, is an increasingly important topic. ERA needs to take a wider view, a longer-term view and one that knits in key topics such as integrity, ethics, transparency and interdisciplinarity at its core.

Q3.3 What impacts has ERA had on:

- a. the Australian university research sector as a whole
- b. individual universities
- c. researchers
- d. Other?

Please explain your answers.

As a whole, throughout the last four ERA rounds, the impacts have been largely positive, meeting the intended objectives of identifying and comparing research strengths across the University sector and driving behaviours that focus on quality not quantity. With each round there is still a degree of optimisation that occurs, which is an unwanted consequence of behaviours which could be negated with the addition of transparency regarding the HEPs submission data at a high-level. Introducing that level of transparency does mean any changes for the future should be robust and underpin the ERA principles and stand up to scrutiny, we would welcome further discussions with the ERA stakeholders regarding a pilot where data driven insights could be measured about the value of proposed changes, where efficiencies have been made how this would improve future ERA rounds that benefit all stakeholders.

Q3.4 How do you use ERA outcomes? *Please describe.*

No response.

Q3.5 ERA outcomes are beneficial to you/your organisation. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

No response.

Q3.6 Do you have any suggestions for enhancing ERA's value to you/your organisation? *Please explain your answer.*

No response.

ERA methodology

ERA methodology at a glance

Q3.7 The current methodology meets the objectives of ERA. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

Disagree.

The current ERA methodology was useful during the first round; however, the methodology should be reviewed to see if certain changes should be implemented such as volume thresholds. Should these thresholds be adjusted as more institutions receive a rating of ERA 4 and ERA 5? The current ERA approach relies on iterations of the ERA Journal list that are updated for each round. This reliance on journal-level classifications is challenging in the context of an increasingly interdisciplinary research landscape.

Future rounds of ERA could:

- consider the use of article-level classification;
- consider increased transparency of evaluation methodology;
- consider inclusion of reproducibility standards;
- consider greater weighting on ethical standards;
- consider use a wide basket of metrics and indicators to incentivise broader outcomes such as greater interdisciplinarity, greater international collaboration, and increased contributions to environmental sustainability;
- consider improvements to technological solutions that empower the sector to reduce its administrative burden.

Q3.8 What are the strengths of the overall methodology? *Please describe.*

No response.

Q3.9 What are the weaknesses of the overall methodology? *Please describe.*

See Q3.7.

Citation analysis methodology

Q3.10 The citation analysis methodology for evaluating the quality of research is appropriate. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Disagree.

The use of citation analysis as a proxy to measure the quality of research has

always been questionable and the rise of DORA, the Leiden Manifesto and the Metric Tide report in the UK make clear that this opinion is not marginal but rather a reflection of the mainstream.

Citation analysis is, at best, a measure of attention associated with a piece of research. The only effective way to assess quality is to critically read a piece of research and to formulate an opinion from a panel of experts. To focus overly on citations in quality assessment is to push the research base toward popular research, rather than good research.

Citations can be used when correctly normalised against the size of the research field and age of output to understand the relative attention that a piece of research has received within its field. However, the quality or importance of that piece of research cannot be determined solely from such metrics.

A broad basket of metrics can be brought together to support and ensure peer review is performed efficiently and in an unbiased manner. Such a basket can include citations-based metrics but could also include reproducibility metrics, public-engagement metrics, translation/application of research. None of these metrics directly speak to quality, but all seek to contextualise the research for an expert to efficiently develop an understanding of the reach and impact of this research relatively to its field and consequently to form an opinion of quality.

One way to test this theory is to run a retrospective analysis to identify what changes and outcomes would have been experienced if a new methodology was implemented. Proposed potential changes to include the introduction of article level classification as this is an automated process in Dimensions. Which means anyone reviewing Dimensions will see the same result and diminishes the need for HEPs to select the FoR assignment for multidisciplinary journals, which large and large is a manual process, time consuming and open to interpretation. This would also save value time for those participating in the Research Evaluation Committee meeting expert reviews where details are verifiable and reproducible. Additionally, the release of the ERA Journal list is diminished, and the time spent from all stakeholders reviewing the next iteration during the ERA Journal list Consultation is potentially no longer needed.

Q3.11 Does the discipline-specific approach for evaluating research quality (citation analysis or peer review for specific disciplines) continue to enable robust and comparable evaluation across all disciplines?

As citation-evaluation-based fields are nudged increasingly closer to international norms, they move further from a comparable base with HASS subjects. A two-speed system already is and will continue to emerge based on the difference in evaluation methodology (and funding). Either this is an accepted outcome that sits comfortably with the needs of the Australian sector at this time or it needs to be addressed. In Digital Science's opinion, were the

Australian sector to wish to put subjects on a more even footing, a two-step process would need to take place in which metrics were determined across all fields and peer review would need to be introduced in a more homogeneous manner to ensure a greater level of comparability across fields.

Q3.12 What are the strengths of the citation analysis methodology? *Please describe.*

Although a blunt instrument, the current methodology is relatively more efficient than other approaches seen elsewhere in the world for evaluation. It also has the effect of drawing attention to Australian successes and focusing minds in the sector on what might constitute good research, which is no minor contribution. However, this comes with some concerning and potentially subtle long-range side-effects as mentioned above.

Q3.13 What are the weaknesses of the citation analysis methodology? *Please describe.*

See Q3.10, Q3.11.

Q3.14 Can the citation analysis methodology be modified to improve the evaluation process while still adhering to the ERA Indicator Principles? *Yes/No.*

Yes

- a. If you answered 'Yes', please describe how the methodology could be improved.

See Q3.7, Q3.10.

Peer review methodology

Q3.15 The peer review methodology for evaluating the quality of research is appropriate. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

No response - would require much greater detailed understanding of the peer review methodology to comment in a responsible and meaningful way.

Q3.16 What are the strengths of the peer review methodology? *Please describe.*

No response - would require much greater detailed understanding of the peer review methodology to comment in a responsible and meaningful way.

Q3.17 What are the weaknesses of the peer review methodology? *Please describe.*

No response - would require much greater detailed understanding of the peer review methodology to comment in a responsible and meaningful way.

Q3.18 Can the peer review methodology be modified to improve the evaluation process while still adhering to the ERA Indicator Principles? *Yes/No.*

No response - would require much greater detailed understanding of the peer review methodology to comment in a responsible and meaningful way.

- a. If you answered 'Yes', please describe how the peer review methodology could be improved.

No response - would require much greater detailed understanding of the peer review methodology to comment in a responsible and meaningful way.

Contextual indicators

- Q3.19 The volume and activity indicators are still relevant to ERA. Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.

Neither agree nor disagree. We believe that a greater range of supporting indicators would be helpful.

- Q3.20 The publishing profile indicator is still relevant to ERA. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Neither agree nor disagree. We believe that a greater range of supporting indicators would be helpful.

- Q3.21 The research income indicators are still relevant to ERA. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Neither agree nor disagree. We believe that a greater range of supporting indicators would be helpful.

- Q3.22 The applied measures are still relevant to ERA:

- a. Patents. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Agree. Dimensions also includes Patents that are classified with the same consistent approach as publications and grants at the article level using the ANZSRC FoR and other ⁵classifications systems.

- b. Research commercialisation income. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Agree. This would certainly be part of a wide basket of appropriate indicators.

- c. Registered designs. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Agree. This would certainly be part of a wide basket of appropriate indicators.

⁵ Other Classification Systems p5: Dimensions Data Guide: Herzog, Hook, McGrath

- d. Plant breeder's rights. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Agree. This would certainly be part of a wide basket of appropriate indicators.

- e. NHMRC endorsed guidelines. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Agree. This would certainly be part of a wide basket of appropriate indicators.

ERA rating scale

- Q3.23 The five-band ERA rating scale is suitable for assessing research excellence. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Agree. However, the full range of grades should be used in order to allow differentiation. This may require definition of rebasing of the existing categories.

- Q3.24 Noting that 90% of units of evaluation assessed in ERA 2018 are now at or above world standard, does the rating scale need to be modified to identify excellence? *Yes/No.*

Yes

- a. If you answered, 'Yes', please explain how the rating scale can be modified to identify excellence.

The State of Australian Universities Report 2018 - 2019⁶ indicates that 66% of units assessed in 2018 are either an ERA 4 or ERA 5 rating. Unless other levels are introduced it will be hard to see which universities have improved or declined since the last ERA round.

ERA low-volume threshold

- Q3.25 The ERA low-volume threshold is appropriate. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Disagree. Volume thresholds can be manipulated to choose whether to play or not play in certain categories. Ideally, a methodology would be introduced that allowed all research to be returned and evaluated.

- Q3.26 Are there ways in which the low-volume threshold could be modified to improve the evaluation process? *Please describe.*

⁶ The State of Australian Universities Report 2018 - 2019 <https://dataportal.arc.gov.au/ERA/NationalReport/2018/>

See Q3.25.

ERA staff census date

- Q3.27 What is the more appropriate method for universities to claim research outputs—staff census date or by-line? *Please explain your answer.*

Staff census date is more appropriate. Where the research is performed is less important than the environment that a university is currently creating. By-line is a lagging indicator or where was good. Staff census date gives an indication of where is a good place on the chosen date. Of course, this leads to transfer market dynamics and a variety of forms of gaming, but overall, Digital Science feels that the staff census date gives a better and more recent picture of an organisation.

- Q3.28 What are the limitations of a census date approach? *Please describe.*

See Q3.27.

- Q3.29 Would a by-line approach address these limitations? Yes/No. *Please explain your answer.*

While by-line would suppress transfer market dynamics it introduces other issues. By-line metadata from publishers is not uniformly reliable, particularly in the way in which joint appointments and multiple affiliation are represented. This approach would require new policies introduced by HEPs and agreement with journal editors and publishers to capture and publish the metadata for attribution purposes.

- Q3.30 What are the limitations of a by-line approach? *Please describe.*

See Q3.29.

ERA interdisciplinary research and new topics

- Q3.31 ERA adequately captures and evaluates interdisciplinary research. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Disagree. FOR / Journal list methodology is an inherently “unfriendly” structure for interdisciplinarity.

- a. If you disagreed with the previous statement, how could interdisciplinary research best be accommodated? *Please describe.*

There is no silver bullet here. A successful approach requires large-scale cultural change across the sector. However, the introduction of an interdisciplinary panel to act as a super panel to oversee the determination

of any work listed as interdisciplinary could be a helpful mechanism to draw attention to and champion this issue.

ERA and Indigenous research

Q3.32 My institution would meet ERA low-volume threshold in Indigenous studies at:

- a. Two-digit? *Yes/No. If you answered 'yes', please list which ones.*

Not applicable

- b. Four-digit? *Yes/No. If you answered 'yes', please list which ones.*

Not applicable.

Q3.33 In ERA, the best approach for evaluating Indigenous Studies is (*choose one*):

- a. Using established ERA methodology i.e. the low-volume threshold would apply to the Indigenous Studies discipline and all its specific disciplines

No response.

- b. For Aboriginal and Torres Strait Islander studies by combining low-volume disciplines into single units of evaluation

No response

- c. For Aboriginal and Torres Strait Islander studies by combining low-volume disciplines into two units of evaluation (one unit comprising Humanities, Arts, and Social Sciences disciplines and one unit comprising Science, Technology, Engineering and Mathematics disciplines)

No response.

- d. Other. *Please describe.*

No response.

Q3.34 What would be the advantages and/or disadvantages of your preferred approach for evaluating Indigenous studies in ERA? *Please describe.*

No response.

ERA process

Collection of ERA data

Q3.35 ERA should move to an annual collection of data from universities. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree.*

Please explain your answer.

Neither agree nor disagree. This would largely depend on whether there were changes for the future ERA rounds as far as data collection and submission.

In reality the HEPs already collect output data annually as this was a previous statutory requirement for the HERDC submission. Although publication outputs are no longer required as part of the HERDC submission for the distribution of Research Block Grants by the Government, universities continue to collect data annually as the re-use of data has proven to be useful in terms of informing the HEPs with data driven insights, for future institutional strategic decisions. The burden of annual data collection is scaled up for larger HEPs with more outputs - which may mean an annual process is less easy to accommodate; a longer collection period would give them more time to prepare.

If the annual collection of data were implemented in a way that provided efficiencies, reducing the administrative burden and cost and introducing a level of transparency, then an annual collection would make sense and would be welcomed by all stakeholders. Digital Science would welcome discussions on approaches where automated processes could assist with the administrative burden, saving time and costs associated with data collection and reporting.

Q3.36 What would be the advantages and/or disadvantages of an annual data collection? *Please describe.*

Advantages - If the collection included efficiencies as mentioned above in Q3.34.

Disadvantages - In the current form if the ERA were to move to annual collection, it would increase the current costs for the HEPs, cost, time and resources could be compared against the past HERDC annual reporting requirements that including the collection of publication outputs, furthermore there would be a need to have certain details earlier such as the citation provider, the reference period and ERA Journal list, which means all stakeholders would be affected as far as providing sufficient time for public consultation and preparing key documents and technical requirement, if the existing frameworks remained unchanged. This impact of burden would also depend on perimeters for annual collection i.e. would this framework require annual collection and submission for the purpose of the ERA?

Publication of ERA data

Q3.37 In future ERA rounds, should the volume of outputs submitted for each unit of evaluation be included in the National Report?

a. Yes, *Please explain your answer.*

The more data published the greater the transparency and thus accountability.

This also allows for other stakeholders to re-use data, potentially leading to incidental development and unrealised return on investment.

- b. No, *Please explain your answer.*

No response.

- Q3.38 In future ERA rounds, research outputs should be published with their assignment to specific disciplines following completion of the round. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Strongly agree.

- a. What would be the advantages? *Please explain your answer.*

This would provide transparency and ensure accountability, and from a reputational standpoint enhance trustworthiness. Additionally, publishing this data will allow the repeatability and robustness of the process to be properly tested, both important underpinning principles of the ERA. Furthermore, new innovations could emerge by allowing reuse of data for analytical purposes, for example new ways of visualising emerging research disciplines.

- b. What would be the disadvantages? *Please explain your answer.*

No response

- Q3.39 What other data do you think the ARC should publish following an ERA round? *Please describe.*

Gender by research discipline, and type of researcher (Early, Mid and Established), just to name a few, Digital Science would welcome further discussions with ERA stakeholders on other data that could be considered.

Section 4—Engagement and Impact Assessment

EI Overview

- Q4.1 Considering that EI is a new assessment, to what extent is it meeting its objectives to:
- a. encourage greater collaboration between universities and research end-users, such as industry, by assessing engagement and impact? *A very large amount; A large amount; A moderate amount; A small amount; Not at all. Please explain your answer.*

A moderate amount.

There is not a lot of detail available publicly on the ARC website⁷, that provides a holistic view of the collaboration mentioned above and it is very difficult to

⁷ Engagement and Impact Assessment 2018-19 National Report - <https://dataportal.arc.gov.au/EI/NationalReport/2018/>

get an idea of the collaboration at a glance between all the stakeholders mentioned above unless you go to the individual case studies via the ARC portal or showcased by HEPs on their respective websites. Given the case studies at the institutions' website, with the publicly available information one could infer there was a great deal of collaboration for the stakeholders listed above, however as most institutions have selected which case studies are made public these do not offer a comprehensive view on the collaboration between universities, research end-users and industry at all levels including discipline level, a future improvement for consideration would be to visualise the collaboration links based on the portfolio submissions made by the HEPs. Digital Science would welcome further discussion on what is possible and provide further examples on what we have done in the past.

- b. provide clarity to the Government and the Australian public about how their investments in university research translate into tangible benefits beyond academia? *A very large amount; A large amount; A moderate amount; A small amount; Not at all. Please explain your answer.*

A small amount.

As mentioned above there is very little data providing a summary of the E&I across the research disciplines, whilst the detailed information is available when searching individual ⁸Engagement and ⁹Impact studies and aggregated HEP submission ¹⁰E&I outcomes are available, as an interested member of the public further analysis would be required such as using the API to really understand the outcomes and benefits beyond Academia. There is an opportunity to understand how investments in research result in downstream innovation by measuring patent and non-patent citations, public policy and discussions amongst clinicians.

- c. identify institutional processes and infrastructure that enable research engagement? *A very large amount; A large amount; A moderate amount; A small amount; Not at all. Please explain your answer.*

A large amount, from the HEPs perspective.

As a member of the public the response would be 'not at all', as this information is not available publicly.

- d. promote greater support for the translation of research impact within institutions for the benefit of Australia beyond academia? *A very large amount; A large amount; A moderate amount; A small amount; Not at all. Please explain your answer.*

A moderate amount.

⁸ Engagement studies - <https://dataportal.arc.gov.au/EI/Web/Engagement/Engagement>

⁹ Impact studies - <https://dataportal.arc.gov.au/EI/Web/Impact/ImpactStudies>

¹⁰ Engagement and Impact outcomes - <https://dataportal.arc.gov.au/EI/Web/Outcomes>

From the perspective of a researcher, E&I activities will be embedded in parts of HEP but not throughout academia in entire institutions. A cultural change of embracing E&I throughout institutions for the translation of research impact is a mid to long term engagement.

- e. identify the ways in which institutions currently translate research into impact? *A very large amount; A large amount; A moderate amount; A small amount; Not at all. Please explain your answer.*

A moderate amount.

The HEPs will facilitate the administration and criteria for achieving a successful E&I return. For upscaling for future returns, HEPs approach to E&I will need to be rolled out across institutions to thoroughly embed Research impact and approaches to translation of research amongst academics.

- Q4.2 The EI objectives are appropriate for the future needs of its stakeholders. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

Agree, as this is the first round, to add future value and address the questions above, the public web report could have additional information, and some visualisation of results such as Engagement and Impact, for privacy reasons the data visualisations could be anonymised or further details should be provided on both Engagement and Impact even if they are rolled up Nationally and/or averaged.

- Q4.3 What impact has EI had on:
- the Australian university sector as a whole? Please describe.*
 - Individual universities. Please describe.*
 - researchers. Please describe.*
 - other sectors outside of academia? Please describe.*

No response

- Q4.4 How do you, or your organisation, use EI outcomes? *Please describe.*

No response

- Q4.5 The EI outcomes are valuable to you or your organisation. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

No response

- Q4.6 How else could EI outcomes be used? *Please describe.*

The EI outcomes can be used as a means to compare against the national agenda, or the Sustainable Development Goals (SDGs) from both a national

and international perspective. Other uses include EI between University and Industry to identify leading industry and emerging industry sectors both nationally and internationally. Model best practices through success stories from idea, conception and outcome.

EI definitions

- Q4.7 The current Engagement definition is appropriate. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree.*

No response

- a. If you don't agree, what are your suggested amendments to the Engagement definition? *Please describe.*

No response

- Q4.8 The current Impact definition is appropriate. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree.*

Agree. It is key that the definition of Impact should be carefully oriented around timescale over which impact is expected. The current definition stated in your document does not include a timescale definition and this may be a significant advantage compared to other definitions¹¹.

- a. If you don't agree, what are your suggested amendments to the Impact definition? *Please describe.*

No response

- Q4.9 The current end-user definition is appropriate. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree.*

No response

- a. If you don't agree, what are your suggested amendments to the end-user definition? *Please describe.*

No response

- b. Are there any end-user categories excluded in the current definition of research end-user that you think should be included? *Please explain your answer.*

No response

- Q4.10 Are there other key terms that need to be formally defined? *Yes/No. If you answered 'Yes', please explain your answer.*

No response

¹¹ <https://blogs.lse.ac.uk/impactofsocialsciences/2020/09/01/from-impact-to-inequality-how-post-covid-19-government-policy-is-privatising-research-innovation-2/>

El methodology

Unit of assessment

- Q4.11 Are the two-digit Field of Research codes the most appropriate method to define units of assessment for Engagement and Impact? *Yes/No. Please explain your answer.*

Yes. The two-digit Field of Research code provides sufficient breadth to display disciplines where EI occurs. Using the four-digit code (or six-digit code) potentially provides a more refined image of EI activities, although decisions on where to submit and how to assess would get more complex for HEPs when preparing their submissions so we agree the two-digit FoRs is sufficient.

- Q4.12 Are there other ways to classify units of assessment in EI, for example, SEO codes? *Yes/No. Please explain your answer.*

Yes, there are other classifications available such as the UN Sustainable Development Goals. With the [latest announcement](#) of a Dimensions new module in line with the Dimensions evolution the good news is this the [SDGs](#) are already available as a public dataset.

Selectiveness of EI

- Q4.13 Should there be more or fewer units of assessment per university? *More units of assessment; The same number as in EI 2018; Fewer units of assessment.*

No response

- a. How many and why? *Please explain your answer.*

No response

EI low-volume threshold

- Q4.14 The EI low-volume threshold should continue to be based on the number of research outputs submitted for ERA. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree.*

Agree. It is more difficult to make a similar argument to the one that we made in the corresponding section regarding core publications outputs in this case since not all areas can be expected to participate in EI.

- a. If you disagree, how should eligibility for assessment in EI be determined? *Please explain your answer.*

No response

- Q4.15 The low volume threshold is set at the appropriate level. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

No response

Engagement indicators

- Q4.16 Overall, the engagement indicator suite for the assessment of research engagement is suitable. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Neither agree or disagree. Alternative metrics could also be used for future E&I rounds to demonstrate engagement and reach.

- Q4.17 The cash support from research end-users indicator using HERDC data is appropriate for the assessment of research engagement? *Strongly agree; agree; neither agree nor disagree; disagree; strongly disagree. Please explain your answer.*

No response

- Q4.18 The research commercialisation income is appropriate for the assessment of research engagement. *Strongly agree; agree; neither agree nor disagree; disagree; strongly disagree. Please explain your answer.*

No response

- Q4.19 Are there additional metrics that would be appropriate across many or all disciplines? *Yes/No. If you answered 'Yes', please outline the metrics. If you answered 'No', please explain your answer.*

Yes, as mentioned above Q4.16 complementary alternative metrics could be used for future E&I rounds. These include:

- a. For Arts, Humanities, and Social Sciences: Use of monographs in university reading lists and syllabi, discussions on social media among key groups, Knowledge mobilization metrics like Public policy citations to research and Wikipedia and news media links to research.
 - b. For STEM: The above, plus non-patent citations (i.e. citations from patents to research articles).
- Q4.20 Are there alternative metrics that would be appropriate across many or all disciplines? *Yes/No. Please specify the metrics.*
- Yes, see above for suggestions (Q4.19).
- Q4.21 Should any of the current Engagement metrics be redesigned? *Yes/No. If you answered 'Yes', which ones and how?*

Yes. We believe that a broader range of Engagement metrics could be introduced to better contextualise an article. Introducing robust field normalisations and a more multi-faceted approach to these metrics would help evaluators to better place outputs.

- Q4.22 The co-supervision of HDR students should be made an engagement indicator in future rounds of EI. *Strongly agree; Agree; Neither agree or*

disagree; Disagree; Strongly disagree. Please explain your answer.

No response

Q4.23 In your opinion, are any of the ERA applied measures appropriate indicators of research engagement in EI?

- a. Patents. Yes/No. Please explain your answer.
Yes, patent filings can signal a corporate spin off or collaboration with Industry. Citations to research from patents can signal foundational research that underpins innovation.
- b. Research commercialisation income. Yes/No. Please explain your answer.
Yes, this demonstrates value, the research has been commercialised and is generating income.
- c. Registered designs. Yes/No. Please explain your answer.
Yes, registered designs can signal a corporate spin off or collaboration with Industry. Citations to research from patents can signal foundational research that underpins innovation.
- d. Plant breeder's rights. Yes/No. Please explain your answer.
Yes, similar to the patent situation, plant breeder's rights provide a monopoly for plant breeders of 20 or 25 years for trees and vines, giving them the exclusive right to the new plant variety, which can showcase the research engagement.
- e. NHMRC endorsed guidelines. Yes/No. Please explain your answer.
Yes.

On a national (NHMRC) as well as international level (e.g. NICE), engaging and influencing medical and clinical guidelines display an appropriate indicator of research engagement

Engagement narrative

Q4.24 The narrative approach is suitable for describing and assessing research engagement with end-users. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

Strongly agree.

The context of underpinning research delivering impact is essential to convey the influence of the work to non-academic users of the public. Quantitative metrics can support statements of impact and engagement, but themselves cannot definitively prove research impact.

- a. If you disagree, what alternative approach could be used to replace the narrative? *Please explain your answer. If you are suggesting indicators, please be specific.*

No response

Q4.25 One engagement submission per broad discipline is sufficient for capturing the research engagement within that discipline. *Strongly agree; Agree;*

Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.

Agree.

There is value in having a HEP specific approach to impact in the relevant UoA that outlines the strategy on delivery of impact. This is in addition to the impact narrative per case study with specific details concerning the case at hand. no response

- Q4.26 The engagement narrative needs to be longer. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

Neither agree nor disagree.

In our view the current limit is suitable. Narrowing down the limit may lead to insufficient description of the activities, engagement and impact. Expanding may lead to unnecessarily increasing the burden on writer and reader

- Q4.27 Additional evidence is needed within the narrative. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

Disagree.

We believe that evidence is already required in other parts of the narrative and there should be no reason to increase the burden on administrators.

- a. If you agreed, what evidence should be provided? *Please describe.*
No response

Impact narrative

- Q4.28 The narrative approach is suitable for describing and assessing impact. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

Agree.

As above (Q4.24), we suggest that context is paramount to accurately explaining research impact, and that quantitative indicators alone cannot convey proper meaning. We believe that in some cases, quantitative indicators can be used to illustrate impact claims.

- a. If you disagree, what alternative approach could be used to replace the narrative? *Please explain your answer. If you are suggesting indicators, please be specific.*

No response

- Q4.29 One impact study per broad discipline is sufficient for capturing the research impact within that discipline. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

Disagree.

Impact studies show a very broad and varied profile even within a broad discipline. HEP with disproportionate discipline coverage will be disadvantaged by the one impact study per broad discipline rule and may not be able to show the immense and varied impact within one broad discipline

- Q4.30 The impact narrative needs to be longer. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

Neither agree nor disagree.

Similar to our response to Q4.26 on the length of EI narratives, our view is that the current limit is suitable. Expanding may lead to unnecessarily increasing the burden on writer and reader

- Q4.31 There is a need for additional evidence to be provided within the narrative. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

a. If yes, what evidence should be provided? Please explain your answer.

Neither agree or disagree.

Highlighting additional evidence in the narrative may be counterproductive in the user reading and engaging with the impact narrative. WE agree with the need for further evidence in theory, however it should be made available in a separate section. The UK REF impact case study is an example where evidence and underpinning research has been separated into a different section and narrative from the impact summary (the equivalent to the ERA impact narrative)

- Q4.32 In your opinion, are there quantitative indicators that could be used to measure the impact of research outside of academia? *Yes/No. Please explain your answer.*

No.

Without doubt, there are quantitative indicators that could be used to measure outcomes (particularly in more economic oriented types of impact), however the challenging task would be to normalise all types of impact per all disciplines. No indicator can measure the significance and lead to a comparator in an extremely diverse field of outcomes. Even in a 'measurable' field, how would the impact of a medicinal drug (e.g. antiviral) that saved one life compare to a medicinal drug that had economic impact of sales only (and that isn't developed to save lives but assist surgery for example). One could imagine introducing quantitative indicators to inform peer review of impact; however, these should not be used to be the sole base of impact assessment.

- a. If you answered 'yes' to the previous question, please name and describe the quantitative indicator/s, and the disciplines for which they are relevant. *Please list and describe.*

Approach to impact Narrative

- Q4.33 The narrative approach is suitable for describing and assessing approach to impact. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

Strongly agree.

- a. If you disagree, what alternative approach could be used to replace the narrative? *Please explain your answer. If you are suggesting indicators, please be specific.*

- Q4.34 One approach to impact narrative per broad discipline is sufficient for capturing the activities within that discipline. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer*

Neither agree or disagree.

Larger HEPs in particular may be in a position to have more than one approach within a broad discipline and forcing into one statement can be challenging. A potential solution could be to extend the word limit in cases where HEPs ask for such an approach.

- Q4.35 The approach to impact narrative needs to be longer. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your Answer.*

Neither agree or disagree. Pending the outcome of other changes to the impact narrative (see above) we deem the approach to the impact narrative appropriate.

- Q4.36 There is a need for additional evidence to be provided. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your Answer.*

Neither agree or disagree.

- Q4.37 Would there be benefits in combining engagement and approach to impact? *Yes/No. Please explain your answer.*

No.

The split in approach and engagement helps the reader to engage with each section in an easy manner. Combining both may lead to ambiguities and misunderstanding in the objective and the pursuit of impact.

EI rating scales

- Q4.38 The engagement rating scale is suitable for assessing research engagement. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

Agree

- Q4.39 The descriptors for the engagement rating scale are suitable. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

Neither agree or disagree. We could think of areas where the wording and descriptors could be improved, e.g. 'interaction' could be more refined and engage with 'collaboration. 'international' for assessment. Other, relevant forms of engagement, e.g. 'global challenges' could be other useful additions.

- Q4.40 The impact rating scale is suitable for assessing impact. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your Answer.*

Agree

- Q4.41 The descriptors for the impact rating scale are suitable. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your Answer.*

Agree

- Q4.42 The approach to impact rating scale is suitable for assessing approach to impact. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

Agree

- Q4.43 The descriptions for the approach to impact rating scale are suitable. *Strongly agree; Agree; Neither agree or disagree; Disagree; Strongly disagree. Please explain your answer.*

Agree

El interdisciplinary research

- Q4.44 Should EI continue to include an interdisciplinary impact study in addition to the two-digit Fields of Research impact studies? *Yes/No. Please explain your answer.*

Yes.

We believe that interdisciplinary research is at the core of what Engagement and Impact is about. Not only between academics (in different disciplines engaging with each other) but engaging with the user community for achieving impact will undoubtedly lead to EI being a successful tool and part of the assessment of Australian HEPs.

El and Aboriginal and Torres Strait Islander research

- Q4.45 Should the EI low-volume threshold be applied to the unit of assessment for Aboriginal and Torres Strait Islander research in EI 2024 with the option to opt in if the threshold is not met? *Yes/No. Please explain your answer.*

No response

- Q4.46 Should the unit of assessment for Aboriginal and Torres Strait Islander research include engagement in EI 2024? *Yes/No. Please explain your answer.*

Yes. Particularly engagement (beyond academic outcomes) can help shape the perception and success achieved by the Aboriginal and Torres Strait Islander research.

Section 5—Overarching Issues Common to both ERA and EI

Frequency of ERA and EI

- Q5.1 How often should ERA occur? *Every three years; Every five years; Other, please specify. Please explain your answer.*

Digital Science: Feedback from the participating HEPs suggests that 3 years is not enough time to go through the process of consultation, preparation, submission and review. A five-year cycle would provide sufficient time to review, collate recommendations, explore opportunities for efficiency and for any changes the timing provides a short pilot - proof of concept - to ensure changes added value, reduced burden and improved processes whilst supporting the underpinning principles.

- Q5.2 What impact would a longer assessment cycle (i.e. greater than three years) have on the value of ERA results, particularly in the intervening years? *Please explain your answer.*

Digital Science: During the intervening years this would allow all ERA stakeholders the opportunity to reflect on the last submission, collate recommendations, explore opportunities for efficiency and account for future changes as the additional time allows for a short pilot - proof of concept - to ensure changes add value, reduced burden and improved processes whilst supporting the underpinning principles.

- Q5.3 How often should the EI assessment occur? *Every three years; Every five years; Other, please specify. Please explain your answer.*

Digital Science: EI should be closely aligned to the ERA timelines as this provides all stakeholders to plan to assess and ensure appropriate capacity, skills, data collection and reporting are in place. Digital Science would welcome conversation with ERA stakeholders about possibilities that exist on processes that could be automated to re-use data as a basis, this would streamline the burden experienced by the HEPs.

- Q5.4 What impact would a longer assessment cycle (i.e. greater than three years) have on the value of EI results, particularly in the intervening years? *Please explain your answer.*

Digital Science: As stated in Q5.1 having the assessment greater than 3 years allows for review, consultation and an opportunity to potentially improve processes and acceptance in the community.

Streamlining and simplifying ERA and EI

- Q5.5 ERA and EI should be combined into the one assessment. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Neither agree nor disagree

- a. What would be the advantages and/or disadvantages. *Please explain your answer.*

No response.

- Q5.6 Are there other ways to streamline the processes to reduce the cost to universities of participating in ERA and EI? *Yes/No. Please explain your answer.*

Digital Science: Yes, with regards to data collection and submission preparation there are now technological solutions that could assist which would reduce the administrative burden and costs to all stakeholders. We would welcome further discussions on how Digital Science could help facilitate and collaborate with the ARC and the HEPs.

- Q5.7 In your view, what data sources could ERA utilise? *Please explain your answer.*

Publication, citation data, patent data, grants and clinical trials, policy documents, datasets, Institutional IDs, DOIs, and Altmetric data: all of these sources are available via Dimensions providing linked data demonstrating the cycles of the research lifecycle from conception of the idea, grants, engagement, published outputs, and other valuable data sources would be ORCID, gender, (definition of research career, early, mid, established)

- Q5.8 In your view, what are the most time-consuming elements of an ERA submission? *Please describe.*

No response

- a. Are there efficiencies that could be introduced? *Yes/No. Please describe.*

Yes. There are possibilities to streamline the current process with regards to data collection for reporting for the HEPs and the ARC and REC panels. Other efficiencies to explore could be the use of additional proxies that may reduce the time during the review process. Digital Science would welcome further discussions and potentially run a proof of concept to test the returns on different approaches for all stakeholders.

- Q5.9 In your view what are the most time-consuming elements of an EI submission? *Please describe.*

No response

- a. Are there efficiencies that could be introduced? *Yes/No. Please describe.*

As mentioned in Q3.10 we would be happy to talk with the sector to understand how best to collaborate on these efficiencies.

Utilising technological advances and pre-existing data sources

Q5.10 ORCID iDs should be mandatory for ERA. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

- a. What are the advantages and/or disadvantages? *Please explain your answer.*

Agree.

The sector via the Australian ORCID consortium made investments with ORCID, as it was widely accepted, disambiguation of a person/s, particularly with common names can be challenging.

By collecting ORCIDs in the future and ensuring data standardisation, these unique IDs can enrich the data for further analysis in terms of the ERA submission.

Q5.11 The automatic harvesting of output data using ORCID iDs would streamline a university's submission process. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Agree

Symplectic is another part of the Digital Science portfolio and to ease the burden of data collection and reporting, Symplectic's flagship solution Elements has advanced functionality that allows the automatic harvesting of research outputs using a combination of name-based settings and author identifiers including ORCIDs.

- a. What are the advantages and/or disadvantages? *Please explain your answer*

Advantages ensures that auto harvested data has been validated against a person's unique identifier which saves a lot of time reviewing and validation.

Q5.12 DOIs should be mandatory for ERA. *Strongly agree; Agree; Neither agree nor disagree; Disagree; Strongly disagree. Please explain your answer.*

Yes

- a. What are the advantages or disadvantages? *Please explain your answer.*

Advantages, having a persistent unique DOI for research objects where available ensures persistent links to the Digital Objects, data validation can also be streamlined.

Q5.13 Are there new ways to collect data to reduce the cost and burden to universities of participating in ERA and EI whilst maintaining the robustness of the ERA and EI process? *Yes/No. Please explain your answer.*

Yes

a. What are the advantages and/or disadvantages? *Please explain your answer.*

There are new products services and technological advances, such as Dimensions that exposes linked data and a variety of data sources such as linking Publications to Patent-Grants-Clinical Trials-Policy Documents and Datasets, this was a previously challenging manual process, with lots of limitations as data sources were often siloed, unstructured which made the linking of data extremely complex and inconsistent. This is now possible through the linked enrichment data sources within Dimensions that are classified at the article level using the ANZSRC FoRs, using a combination machine learning, artificial intelligence and full text mining.

Digital Science recently announced the launch of a new module¹² the next step in the Dimensions evolution. Through Dimensions Google Big Query, the ARC would be able to use their pre-existing ERA submission data, which would remain private and secure that can be used with all of the Dimensions data. Digital Science would welcome further discussion with the ARC and ERA & EI stakeholders on possibilities, unlocking innovation whilst maintaining the robustness and underpinning the principles of the ERA and EI.

¹² Dimensions partners with Google Cloud and launches integration with BigQuery

Appendix E—Acronyms

Acronym	Full Title
AIMS	Australian Institute of Medical Scientists
ANSTO	Australian Nuclear Science and Technology Organisation
ANZSRC	Australian and New Zealand Standards Research Classification
ARC	Australian Research Council
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DESE	Department of Education, Skills and Employment
DOI	Digital Object Identifier
DST	Defence Science and Technology (formerly DSTO)
EI	Engagement and Impact Assessment
ERA	Excellence in Research for Australia
FoR	Fields of Research
FTE	Full Time Equivalent
HDR	Higher Degree by Research
HERDC	Higher Education Research Data Collection
HoR	The House of Representatives
MBIE	Ministry of Business, Innovation and Employment
NHMRC	National Health and Medical Research Council
NISA	National Science and Innovation Agenda
NMI	National Measurement Institute
RBG	Research Block Grant
REC	Research Evaluation Committee
REF	Research Excellence Framework UK
SEO	Socio-Economic Objective Code
SRE	Sustainable Research Excellence funding
TEQSA	Tertiary Education Quality Standards Agency
ToA	Type of Activity