The Royal Academy of Engineering

Reform of Higher Education Research Assessment and Funding

Response to the Department for Education and Skills
From The Royal Academy of Engineering

September 2006

Key Recommendations

1. A shadow metrics exercise should not be carried out in parallel with RAE2008. The results from such an exercise based on any or all of the five metrics based models set out in the consultation will vary considerably from those of RAE2008. This could lead to QR allocations for RAE2008 being challenged.

2. RAE2008 should continue unaltered. Wholesale changes to the RAE system after 2008 will undermine rather than improve the QR funding allocation system. Instead, RAE2008 should be built on in an evolutionary fashion, reinforcing the behaviours in institutions that funders wish to encourage.

3. The use of metrics in the RAE2008 process has increased over previous assessment exercises and, for engineering subjects (Panel G), is currently at an appropriate level.

4. All of the five proposed metrics based models in the consultation paper are flawed and could lead to unforeseen consequences or behaviours in institutions if adopted

5. The principles developed by the Academy in Measuring Excellence in Engineering Research and The Assessment of Research Quality in Engineering Disciplines should continue to be used in developing the RAE for engineering disciplines as well as other applied science STEM subject areas where appropriate.

6. Over reliance on metrics based on institutions' income from Research Councils and other external sources as a measure of research quality has the potential to reward expensive research rather than good research.

7. The administrative cost and burden of the RAE process is not over burdensome as claimed by HM Treasury and delivers QR funding to institutions for lower overheads as a proportion of funding granted than funding through Research Councils.

Overview

The Royal Academy of Engineering welcomes the opportunity to contribute to the further development of the Higher Education Research Assessment Exercise beyond 2008 and is pleased to note that the Department for Education and Skills (DfES) and the Higher Education Funding Council for England (HEFCE) intend to conduct the 2008 Research Assessment Exercise (RAE) largely as planned.

The Academy is strongly committed to continuously improving the quality of engineering research in the United Kingdom and has published two major reports into assessing research excellence in the engineering field[1,2]. Both of these reports have made a strong case for peer review of research and the fact that the outputs of engineering research are sufficiently different from those of the pure sciences as to justify a different approach, or different weighting, in assessing quality.

In considering this consultation, the Academy held a meeting of Fellows which included those involved in previous studies, Chairs of RAE2008 panels and sub-panels who were Fellows as well as other Fellows who had expressed an interest in the subject. Members of the group are detailed in Annex A. The results of that meeting were circulated in draft form to a wide group of Fellows for comment.

It was clear to the Academy that the current DfES consultation was announced as a response to HM Treasury's March 2006 consultation[3] which stated "The Government's firm presumption is that after the 2008 RAE the system for assessing research quality and allocating "quality related" (QR) funding will be mainly metrics based". This position was justified on the basis of reducing the administrative burden and cost of the Research Assessment Exercise, however, as discussed in the Academy's response to HM Treasury[4], the administrative costs, as a percentage of spend, of the RAE were not excessive and, in fact, lower than that for the Research Council funding in 2001. Although it appears that a comprehensive study of the overall (funding bodies and universities) administration costs for the RAE and Research Council funding has never been published, the Higher Education Policy Institute (HEPI) attempted such an analysis in their May 2006 paper on alternatives to the Research Assessment Exercise[5]. HEPI estimated that the administrative burden of Research Council funding as a percentage of grants awarded was about 10%, whereas the administrative burden of the RAE measured in a similar fashion was about 1%.

Both the current DfES consultation and the previous HM Treasury consultation endorsed the dual funding mechanism and presumed that it would continue. The Academy strongly supports the concept of dual funding and recommends that the proportion of Quality Related (QR) funding should be maintained or increased in order to allow strategic investment in new areas of inquiry and new research teams. This is important for the sustainability of research departments and the promotion of higher risk areas of research.

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[1] Measuring Excellence in Engineering Research, The Royal Academy of Engineering, 2000
[2] The Assessment of Research Quality in Engineering Disciplines: a recommendation to the Higher Education Funding Council for England for adoption in the RAE 2008, The Royal Academy of Engineering, 2005
[3] Science and Innovation Investment Framework 2004 – 2014: next steps, HM Treasury, March 2006
[4] Science and Innovation Investment Framework 2004 – 2014: next steps, Response on behalf of The Royal Academy of Engineering, June 2006
[5] Using Metrics to Allocate Research Funds: A Short Evaluation of Alternatives to the Research Assessment Exercise, Higher Education Policy Institute, May 2006

Similarly, both consultations recommended that a shadow metrics exercise be carried out in parallel with the RAE2008. The Academy strongly disagrees with this proposal and endorses the decision of the RAE2008 Engineering Panel that it cannot be involved in a parallel assessment while carrying out the assessment for RAE2008 based on the published criteria. The reason for this is that the Academy believes that all the metrics models offered would, on a Unit of Assessment (UOA) basis, show significant differences from the results of the current RAE process and could lead to institutions challenging the allocation of funds based on the results of RAE2008. A much safer course of action would be to carry out the shadow metrics exercise separately and after the allocation of QR funding from RAE2008 has been settled.

Within engineering, RAE2008 incorporates a number of changes over RAE2001, all aimed at changing behaviour and encouraging greater involvement with industry. In RAE2008, more weight will be given to the impact of research on wealth creation and quality of life. The benefits of these changes, to which the Academy made a significant contribution, will be lost if the assessment system is significantly changed rather than being allowed to evolve over time and subsequent Research Assessment Exercises.

The consultation's specific questions are addressed below.

Response to specific questions in the consultation document

1. Adoption of greater or wholly metrics based approach by RAE2008 Panels

1.1. The Academy has no remit to offer a view on any subject areas other than engineering, ie those units of assessment covered by RAE2008 Panel G and Computer Science and Informatics (UOA 23) which falls under Panel F. However, engineering shares many traits with other applied sciences with practical outputs, so the arguments put forward in this paper may well be echoed by other organisations representing the applied sciences.

1.2. The Academy agrees with Panel G that it would be unwise to carry out a shadow metrics exercise in parallel with RAE 2008. The reason for this is that the outcome of the shadow exercise will be different to the RAE 2008 and could lead to QR allocations for RAE2008 being challenged. The Academy supports Panel G's proposition that any shadow metrics exercise should be carried out by existing RAE2008 Panels after the current process has been completed.

1.3. Within the engineering disciplines, the weighting of the quality profiles for RAE2008[6] are as below:

- 50% research outputs
- 30% esteem indicators
- 20% research environment

Half of the research environment profile (ie 10% of the overall quality profile) is to be derived from quantitative data on research doctorates awarded per full time equivalent (FTE) member of staff. Similarly, half the quality profile for esteem (ie 15% of the total quality profile) (or two thirds of the quality profile for esteem (ie 20% of the total quality profile) for Metallurgy and Materials) will be based on quantitative data on research grant and contract income per submitted staff FTE. Thus, the overall assessment for 2008 will rely on metrics for 25% (30% for Metallurgy and Materials) of the quality assessment.

1.4. This represents increased and more open use of metrics over RAE2001 overall and consequently a reduction in the administrative efforts required on the part of institutions in making submissions.

1.5. The Academy believes that these metrics, at these levels, are appropriate for the quality assessment of engineering disciplines.

1.6. With the current RAE system there is a causal link between research quality which is output based and research income which is input based. If when using a wholly metrics based system of quality assessment, research income is a driving parameter this causal link will be lost unless output is measured in some other way. The long term consequences of such a change are not properly understood.

[6] RAE 2008 Panel criteria and working methods, HEFCE, January 2006

2. Identification of Metrics

2.1. Over reliance on metrics based on institutions' income from Research Councils and other external sources as a measure of research quality has the potential to reward expensive research rather than good research. Similarly, as external funding, and to a lesser extent Research Council funding, is aimed at established areas of inquiry, the quality measure would be based upon how good an institution was in established fields, leading to conservative approaches. This approach would have a detrimental impact on the growth of innovative, high risk areas of research and the development of new multidisciplinary areas of research.

2.2. Volume measures such as numbers of FTE research active staff and numbers of PhDs awarded have already been incorporated into RAE2008. Although numbers of PhDs awarded are collected through the Higher Education Statistics Agency (HESA), numbers of FTE research active staff are not. If it was proposed that these data be used in future assessments, but be collected by some mechanism other than the RAE, it would not be clear as to how the administrative burden on institutions would be reduced; the burden would simply be shifted from the RAE to some other process.

2.3. The scepticism expressed in the DfES consultation paper on the use of bibliometric data was well placed. In engineering fields of research there is a strong distinction between mode 1 research (pure academic inquiry) and mode 2 research (applied research), together with their bibliometric outputs, although their impact and quality might be deemed to be similar.

2.4. Use of data derived from the Higher Education: Business and Community Interaction Survey could be useful, but distilling such information based on a wide variety of indicators for institutions with very different profiles could prove difficult. Commercial and competition issues within some industries often dictate that ownership of IP generated from industrially sponsored research must reside with the sponsoring company. Thus, an institution which provided a company (and therefore, potentially, the UK) with a competitive advantage through its research might score lowly because it could not retain ownership of the IP generated.

2.5. As well as examining a number of metrics, the consultation paper also examined a number of qualitative data sources (para 4.6) such as peer review, international reviews commissioned by Research Councils and institutional research plans. These are fundamental to assessing the sustainability of a research department and the Academy considers them to be essential elements of robust quality assessment of research departments.

3. Possible Models

3.1. All of the five proposed models for metrics-based quality assessment outlined in the consultation are flawed.

3.2. The current RAE process has evolved over 20 years giving significant weight to qualitative assessments of the quality of research within UOAs. The way that the qualitative elements have been weighted has been influenced by the behaviours within institutions that funding bodies wished to encourage. While it is possible to duplicate the outcome of a particular RAE

using only a set of weighted metrics, it is not clear that, over time, the desired behaviours within institutions would continue to be reinforced.

3.3. The consultation conceded that the current RAE system had been criticised for not being able to adequately assess the quality of multidisciplinary research. All five proposed metrics based models attempted to use metrics mapped to the outcome of the existing RAE process and therefore could not address this problem. Being based purely on metrics with no qualitative analysis, this effect could only be amplified, reducing the incentive for institutions to promote such research.

4. Application to Non-STEM Subjects

4.1. The Academy does not have a view on the applicability of metrics only based research quality assessment to non-engineering subjects.

5. Possible Undesirable Behavioural Changes

5.1. It is certain that any changes in the quality assessment procedures would induce changes in the behaviour of institutions. The removal of qualitative elements in the assessment process would make the control of these behaviours more difficult and the manipulation of outputs by institutions to achieve certain outcomes easier.

5.2. As all proposed metrics based models rely to some extent on the value of industrial and charity research within UOAs, the possibility of research funders other than Research Councils attempting to influence RAE outcomes is created. For example, if the weighting attached to industrial or charity funding was sufficiently high, such funding could become concentrated in a small number of institutions in order to leverage more public funding for certain areas of research.

6. Applicability to all Institutions

6.1. It is inevitable that any change in the process of allocating QR funds will produce winners and losers among institutions and this must be taken into account in designing any proposed new system. The consultation paper conceded that all five proposed metrics based systems favoured larger, research intensive institutions. The Academy has no view on this except that the playing field should be kept level for all institutions.

7. Research Plans as Part of the Assessment Process

7.1. The Academy's view is that a qualitative assessment of institutions' research plans as well as the sustainability of research teams and the quality of the research environment provided by the institutions are all essential to a robust assessment of research quality. While it might be possible to break down performance against past plans and targets as a metric, funding bodies should give significant weight to future research plans. Reliance on performance measured against plans would mitigate against risk taking in new and novel areas of research, probably discriminating against new multidisciplinary fields.

8. The Importance of Independent Assessment of UK Higher Education Research Quality

8.1. The Academy has worked with EPSRC on two international reviews of UK Engineering Research, in 1999[7] and 2005[8]. These and other international reviews in other fields have proved valuable to the Research Councils in providing an assessment of the effectiveness of their funding. Research groups have found them to be beneficial as an indication of their international esteem.

8.2. The administrative burden of international reviews has fallen predominantly on the sponsoring organisations and the international review panels have used readily available data from other sources in order to prepare for visits to departments when a final assessment based on peer review was made.

8.3. These reviews have not previously had any influence on QR funding allocations and because of their infrequency and the limited number of research departments they visit (the object has been to provide a snapshot of the international standing of research in an area rather than to assess each research team separately), they would not be an appropriate input into the QR funding process as they are currently constituted.

9. Conclusions

9.1. The Academy agrees with RAE2008 Panel G that it would be unwise to carry out a shadow metrics exercise in parallel with RAE 2008. The reason for this is that the outcome of the shadow exercise will be different to the RAE 2008 and could lead to QR allocations for RAE2008 being challenged. The Academy supports Panel G's proposition that any shadow metrics exercise should be carried out by existing RAE2008 Panels after the current process has been completed.

9.2. The Academy believes that the level of metrics proposed for use in RAE2008 by Panel G is appropriate for engineering subjects.

9.3. All of the five proposed metrics based models in the consultation paper are flawed and could lead to unforeseen consequences or behaviours in institutions if adopted.

9.4. The principles developed by the Academy in Measuring Excellence in Engineering Research[9] and The Assessment of Research Quality in Engineering Disciplines[10] should continue to be used in developing the RAE for engineering disciplines as well as other applied science STEM subject areas where appropriate.

9.5. The Academy agrees with DfES that the RAE2008 should continue largely unaltered, but the Academy believes that wholesale change of the RAE system after 2008 would undermine rather than improve the QR funding

[7] International Perceptions of UK Engineering Research, Royal Academy of Engineering and EPSRC, November 1999
[8] The Wealth of a Nation: An Evaluation of Engineering Research in the United Kingdom, Royal Academy of Engineering and EPSRC, February 2005
[9] Measuring Excellence in Engineering Research, The Royal Academy of Engineering, 2000
[10] The Assessment of Research Quality in Engineering Disciplines: a recommendation to the Higher Education Funding Council for England for adoption in the RAE 2008, The Royal Academy of Engineering, 2005

allocation system. Instead, RAE2008 should be built on in an evolutionary fashion, reinforcing the behaviours in institutions that funders wish to encourage.

9.6. Over reliance on metrics based on institutions' income from Research Councils and other external sources as a measure of research quality has the potential to reward expensive research rather than good research.

9.7. The administrative cost and burden of the RAE process is not over burdensome as claimed by HM Treasury and delivers QR funding to institutions for lower overheads as a proportion of funding granted than funding through Research Councils.

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Annex A

Fellows of the Academy invited to the meeting organised to consider the Academy's response on 13 June 2006 and contributing to it.

Phil Ruffles CBE FREng FRS*†	Chairman
Dr Stephen Bold FREng†	
Prof David Clarke FREng FRS*†	
Dr Richard Dolby OBE FREng†	
Prof Ann Dowling CBE FREng FRS	(Chair, Panel G, RAE2008)
Prof Rodney Eatock Taylor FREng†	
Prof Nigel Gilbert FREng	
Prof Neil Halliwell FREng	(Chair, Sub-Panel 28, RAE2008)
Prof David Hughes FREng	
Prof Julia King CBE FREng	(Chair, Sub-Panel 29, RAE2008)
Prof Adrian Long FREng	(Chair, Sub-Panel 27, RAE2008)
Prof John Midwinter OBE FREng FRS*†	
Prof David Nethercot FREng*	
Prof David Newland FREng*†	
Prof Stephen Richardson FREng	(Chair, Sub-Panel 26, RAE2008)
Prof Keith van Rijsbergen FREng FRSE	(Chair, Sub-Panel 23, RAE2008)
Peter Saraga OBE FREng†	
Prof Geoff Tomlinson FREng	(Chair, Sub-Panel 25, RAE2008)
Prof Stephen Williamson FREng	(Chair, Sub-Panel 24, RAE2008)

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† Member of *The Assessment of Research Quality in Engineering Disciplines* Working Group, 2005