

November 2007/34

Policy development

Consultation

Responses should be sent to HEFCE
by Thursday 14 February 2008.

This document sets out proposals for a
new research assessment and funding
framework.

Research Excellence Framework

**Consultation on the assessment and
funding of higher education research post-
2008**

Research Excellence Framework

Consultation on the assessment and funding of higher education research post-2008

To Heads of HEFCE-funded higher education institutions
Heads of universities in Northern Ireland

Of interest to those responsible for Research funding and management, Planning

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Executive summary

Purpose

1. This document sets out proposals for the future research assessment and funding framework – the Research Excellence Framework (REF) – that will be introduced after 2008.

Key points

2. The Government has asked HEFCE to develop a new framework for research assessment and funding that makes greater use of quantitative information – ‘metrics’ – than the current arrangements. This will be introduced gradually between 2010 and 2014 following the 2008 Research Assessment Exercise (RAE). Some key elements in the new framework have already been decided; this publication presents initial proposals on how they should be delivered. In summary, this consultation covers the following issues:

- **Subject divisions:** within an overarching framework for the assessment and funding of research, there will be distinct approaches for the science-based disciplines (in this context, the sciences, technology, engineering and medicine with the exception of mathematics and statistics) and for the other disciplines. The paper proposes where the boundary should be drawn between these two groups and proposes a subdivision of science-based disciplines into six broad subject groups for assessment and funding purposes.
- **Assessment and funding for the science-based disciplines** will be driven by quantitative indicators. We will develop a new bibliometric indicator of research quality.

This document builds on expert advice to set out our proposed approach to generating a quality profile using bibliometric data, and invites comments on this.

- **Assessment and funding for the other disciplines:** a new light touch peer review process informed by metrics will operate for the other disciplines (the arts, humanities, social sciences and mathematics and statistics) in 2013. We have not undertaken significant development work on this to date. This publication identifies some key issues and invites preliminary views on how we should approach these.
- **Range and use of quantitative indicators:** the new funding and assessment framework will also make use of indicators of research income and numbers of research students. This publication invites views on whether additional indicators should be used, for example to capture user value, and if so on what basis.
- **Role of the expert panels:** panels made up of eminent UK and international practising researchers in each of the proposed subject groups, together with some research users, will be convened to advise on the selection and use of indicators within the framework for all disciplines, and to conduct the light touch peer-review process in non science-based disciplines. This document invites proposals for how their role should be defined within this context.
- **Next steps:** the paper identifies a number of areas for further work and sets out our proposed workplan and timetable for developing and introducing the new framework, including further consultations and a pilot exercise to help develop a method for producing bibliometric quality indicators.
- **Sector impact:** a key aim in developing the framework will be to reduce the burden on researchers and higher education institutions (HEIs) created by the current arrangements. We also aim for the framework to promote equal opportunities. This publication invites comments on where we need to pay particular attention to these issues in developing the framework and what more can be done.
- **Territorial coverage of the proposals:** this publication launches a HEFCE consultation on a new funding and assessment framework for England. The higher education funding councils for Wales and Scotland are conducting parallel consultations with the aim of developing with us a single framework for research quality *assessment* that could operate across the UK; they will bring forward their own proposals for research *funding* in due course. While Northern Ireland is also participating in the HEFCE consultation, they too will be developing their own proposals for research funding.
- **Responding to the consultations:** responses are invited by e-mail by 14 February 2008 from HEIs and all other interested bodies. HEIs in Scotland and Wales, and other stakeholders based in a particular territory within the UK, should respond directly to the appropriate funding council. HEIs in Northern Ireland are invited to reply to HEFCE and to send a copy of their reply to the Department for Employment and Learning.

3. We are planning (and in some cases already undertaking) further work which will inform the implementation of the new framework following these consultations.

Action required

4. Responses to HEFCE are invited by e-mail, using the form at Annex A, by **Thursday 14 February 2008**. The form can be downloaded from the HEFCE web-site (www.hefce.ac.uk) with this document under Publications.

5. Institutions interested in taking part in the pilot exercise during 2008 should contact the appropriate funding council by 31 January 2008. Institutions in England and Northern Ireland should contact Victoria Waite, tel 0117 931 7254, e-mail refconsultation@hefce.ac.uk.

Background

6. Following a government consultation exercise on the reform of HE research assessment and funding,¹ the pre-budget report in December 2006² announced that the 2008 Research Assessment Exercise (RAE) will go ahead as planned, but that a new framework for the assessment and funding of research will then be introduced that makes greater use of quantitative information – ‘metrics’. It set out the broad features of a single overarching framework, within which the current applicability of metrics in different disciplines will be accommodated.

7. Following the 2006 consultation exercise, it was concluded that:

- While the 2008 RAE will go ahead as planned, and will substantially inform funding up to 2014, it will be replaced by a new framework after 2008.
- The new assessment and funding framework will be based as far as possible on quantitative measures. There will be an overarching framework within which differences between the disciplines will be accommodated. For the science-based disciplines, funding and assessment will be driven by bibliometric indicators of research quality and data about external research income and research students. For the arts, humanities and social sciences, there will be a light touch peer review process, informed by metrics.
- Funding and assessment will operate at the level of six or seven broad subject groups covering the sciences, engineering, technology and medicine; and a larger number of subject groups for the arts, humanities, social sciences and mathematics and statistics. The process will be overseen by a panel of experts for each subject group.
- For the sciences, the new framework will be phased in gradually from 2010 until all our research funding is driven by it from 2014. For the other subjects, the light touch peer review process will take place in 2013, to drive funding from 2014.

¹ ‘Reform of higher education research assessment and funding’ (Department for Education and Skills, June 2006). A summary of responses can be found on the web at www.dcsf.gov.uk/consultations.

² Chapter 3, ‘Pre-Budget Report 2006’ (HM Treasury, December 2006).

8. In December 2006 the Secretary of State for Education and Skills wrote to the Chairman of HEFCE asking us to develop the new framework in consultation with the sector and working with the other UK funding bodies. He asked us to pay particular attention to the guiding principles of robust quality assurance underpinning funding and reducing the burden on universities and their staff, and to report progress by 30 September 2007.

Project aims

9. This document reports on our work so far to develop a new framework – the Research Excellence Framework (REF) – and invites views on a number of key issues. Our aims in developing the framework are:

- to produce robust UK-wide indicators of research excellence for all disciplines which can be used to benchmark quality against international standards and to drive our funding for research
- to provide a basis for distributing funding primarily by reference to research excellence, and to fund excellent research in all its forms wherever it is found
- to reduce significantly the administrative burden on institutions in comparison to the RAE
- to avoid creating undesirable behavioural incentives
- to promote equality and diversity
- to provide a stable framework for our continuing support of a world-leading research base within HE.

10. In practical terms therefore we are working to develop a new framework for research assessment and funding which:

- a. Encompasses the full range of academic disciplines and types of research within a single overarching structure, while providing for significant differences between discipline groups in how research is undertaken and published and in the coverage and applicability of key indicators.
- b. Applies similar criteria and indicators to all disciplines as far as possible within the differentiated assessment approach, and produces quality indicators in a common form for all disciplines.
- c. Builds upon and works with the approaches to assessment and funding that we have introduced, and will develop during 2008, in the context of the 2008 RAE.
- d. Fully reflects national policy aims for the research base: in particular, promoting excellence and dynamism and encouraging research that benefits the economy and society.

- e. Commands the confidence of HEIs and other key stakeholders.

Scope of this consultation

11. The new framework will cover both quality assessment and funding. We are working with the other UK higher education funding bodies to develop proposals for a research *quality assessment* regime that could be operated across the UK. The funding councils for Scotland and Wales will be consulting the institutions that they fund and their other stakeholders on this basis. As is the case at present each of the four UK funding bodies will develop its own grant allocation arrangements, and consequently any proposals in this publication relating to *funding* arrangements should be read as applying to England only.

12. This publication highlights in particular the question how to develop bibliometric quality indicators for science-based disciplines and seeks views on our proposed approach, since this element within the overall assessment and funding framework requires the most significant new work. The consultation also outlines other aspects of the framework and seeks initial feedback on them; as we continue our work we will bring forward for consultation more detailed proposals on these other elements, including specifying fully the part to be played within the framework by each of the indicators, and the development of a light touch peer review process for the arts, humanities and social sciences.

13. We have not yet formed a view at this stage on how the various indicators should interact within the funding and assessment framework. For the science-based disciplines, two options to be considered are:

- a. Producing a quality profile using bibliometric analysis alone. Funding allocations would be driven partly by this quality profile and partly by other indicators including research income and research student data. We are confident that this approach is feasible and would be robust.
- b. Developing a compound quality indicator based on bibliometric analysis combined with other quantitative indicators. This quality profile would either drive all QR funding, or would drive the allocations in combination with other indicators that do not already influence the quality profile.

14. For the other disciplines, a quality profile would be produced through peer review clearly informed by relevant indicators. This would drive an appropriate part of QR, alone or in combination with other indicators, to complement the approach at a. or b. above.

15. These options will be considered in the light of further work including a pilot of the bibliometric indicators. In either case, we envisage an approach in which the interpretation and relative weighting of the indicators could vary to some extent between subject groups following advice from expert panels.

16. In relation to the allocation of funding in England, we would expect the arrangements within the framework to include:

- a. Retaining a direct link between research quality and grant with a substantial portion of funding allocated for all disciplines by a formula driven by quality and volume indicators.
- b. A continuing link between our grant and both charity income and research student numbers; and offering at least the same incentive as at present to undertake research commissioned by business and industry.
- c. Smoothing the impact of any perturbations in our funding to individual HEIs created by the move to the new framework.

17. We shall consult further on these issues at a later stage in our development work.

Proposals for consultation

18. The proposals that follow have been developed on the basis of expert advice and extensive informal discussions with a broad range of contacts in HE and other major stakeholder bodies, including the other UK funding bodies.

Subject groups

19. We aim to develop a single overarching framework for funding and assessment within which a differentiated approach is possible for groups of disciplines, as set out at paragraph 7 above. The new framework will operate with fewer and broader discipline groupings than the current RAE. For science-based disciplines, we envisage relatively broad subject groupings, on a similar scale to the main panel groupings of the 2008 RAE. For other disciplines we envisage fewer subject groups than the present RAE units of assessment.

20. At Annex B we propose which disciplines should be treated as science-based, and how they should be grouped for the purposes of the REF. In brief, we propose to classify as science-based all fields of research covered by main panels A to G in the 2008 RAE, with the exception of mathematics (both pure and applied) and statistics. We consider that establishing subject groups at this broad level of disaggregation will allow enough flexibility to recognise significant differences between disciplines in our funding and assessment arrangements while producing robust and meaningful quality indicators from our preferred method of citation analysis. We intend that the grouping of subjects should also be compatible with the way in which we expect the expert panels to operate.

21. We envisage that research staff will be identified either as:

- falling within the science-based groups, and hence subject to bibliometric analysis; or
- falling within the other disciplines and hence to be submitted for assessment through light-touch peer review.

22. We plan to develop definitions and criteria for determining eligibility for each category based on the primary focus of a researcher's work, bearing in mind that there will always be

some research that does not clearly fit in on one side of the boundary. At this stage we envisage that HEIs will be asked to say early in 2009 which of their staff they wish to be considered as research active in science-based disciplines in the first full bibliometric assessment round.

23. We believe that dividing the science-based disciplines into six subject groups will provide a broad enough basis for applying quantitative indicators, which by their nature provide a more general indication of performance at an aggregate level than would be appropriate for specific disciplines within institutions. Our proposed groups, set out at Annex B, are closely aligned with those established for the 2008 RAE main panels and in most cases the groups are co-terminous with one or more HESA cost centres; by working with established definitions and divisions in this way, we aim to avoid unnecessary perturbation.

24. Note that throughout this paper we use the terms '**science-based disciplines**' and '**subject groups**' to refer to the groupings set out at Annex B – and, in the case of subject groups for the other disciplines, to refer to similar groupings that we shall propose at a later stage in our work. At present we envisage that subject groups in the latter category will be rather fewer in number and larger than the RAE units of assessment, but may still be more numerous and smaller than in the science-based disciplines, reflecting the intention to assess research quality through light touch peer review in these disciplines.

Question 1a: Do you endorse our proposals for defining the broad group of science-based disciplines, and for dividing this into six main subject groups, in the context of our new approach to assessment and funding?

Question 1b: Are there issues in relation to specific disciplines within this framework that we should consider?

Bibliometric indicators of research quality

25. In developing the new framework so far we have focused on evaluating the potential for using bibliometric indicators of quality in the science-based disciplines, formulating an approach to producing these indicators, and determining what further work will be necessary to implement such a system.

26. We commissioned the Centre for Science and Technology Studies (CWTS) at Leiden University to undertake a thorough scoping study, and we also commissioned Evidence Ltd to investigate the implications for interdisciplinary research in particular. The reports from these studies are available on the web at www.hefce.ac.uk under Publications/Research & evaluation.

27. Based on this expert advice and our informal discussions with stakeholders, we are confident that bibliometric techniques can be used to provide a robust and meaningful indicator of research quality across the science-based disciplines, particularly when applied at the broad level of the proposed subject groups.

28. Nevertheless, the development and application of bibliometric indicators on such a large scale for the purposes of the REF will not be straightforward. We take seriously the expert advice

that we must use sufficiently advanced techniques, we must ensure that data is of high quality, we must appreciate the limitations, and we must involve subject experts in the process to ensure that it is robust. Further work is required in each of these areas. We will also need to determine the coverage and criteria for the bibliometric process, and assess the potential behavioural incentives, accountability burden, impact on equal opportunities and implications for sustainability.

29. We have commissioned further technical advice (to report in early 2008) on some of the data and methodological issues, and we plan to run a substantial pilot exercise during 2008.

30. Below we set out our proposed approach to producing and using bibliometric indicators, and outline where further development and testing is required. The section is necessarily quite complex, even though we have tried to give only the minimum information required to understand the reasons for our particular proposals. Readers wishing to comment on these in detail are strongly advised to read the relevant sections of the CWTS report referred to in paragraph 26.

Principles

31. Our proposals for citation analysis rest upon the principle that, when viewed in the aggregate, the research outputs in any discipline that are most highly cited by other researchers will generally be those which have the greatest intellectual influence: thus, at the level of a broad subject group within individual HEIs, the rate of citations to the outputs of their staff is a strong indicator of research quality.

32. It should be emphasised that our application of this principle does not entail the grading or ranking of journal titles (journal impact factors) nor of individual researchers: we do not consider such approaches helpful for our purposes.

33. A number of studies by external organisations have shown a statistically significant positive correlation between bibliometric indices and the outcomes of peer review in specific subject areas. Also, numerous studies have shown that where advanced bibliometric techniques are used, the outcomes have been seen as acceptable by the research groups involved.

Criteria

34. The first stage in producing indicators based on citation data is to define which researchers and outputs will be included in the analysis, over what time frame, and how they will be associated with institutions and subject groups. At this stage our view is that:

a. HEIs should select which of their staff should be included in the process. We can see no prospect of us identifying the relevant staff on an objective basis within the process, in a way that all HEIs and individual staff would accept, and we would not think it right for the Council to assume the responsibility for deciding which individual members of an HEI's staff should be counted in the assessment.

b. All staff with relevant outputs in the science-based disciplines over a defined period will be eligible for selection. Reflecting observed citation practice, the analysis should take

into account research outputs published – and citations to them – over a period of between five and ten years. We are undertaking further work to inform a decision on what period to specify within this range.

35. There are a number of issues to resolve about the criteria, and about how staff should be associated with institutions and subject groups, which we are investigating through further work. Among these issues are:

- whether we should take into account work published within the period by staff employed in an HEI on the census date, or work published by staff who were employed in the HEI at the time of publication
- how to assign a researcher and their work to the proposed subject groups where one person's work falls across subject boundaries within the framework – including where a researcher in a department that appears to fall within one subject group has published mainly in journals that our mapping would assign to another.

Data

36. Production of bibliometric indicators will rely on the use of available data about citations to publications produced by UK HEIs. Initially at least we expect to use the Thomson Scientific Web of Science (WoS) as the primary source of citation data. We are advised that currently it is the only available source that is sufficiently established, has been thoroughly tested through numerous citation studies, and provides good to excellent coverage (in a form that we can use without undue additional preparatory work) of research journals in most science disciplines. Journals are selected for inclusion in the WoS on the basis of their quality and citation impact; we believe that these criteria are appropriate for the purposes of the REF.³

37. Nevertheless, we recognise that there are limitations to WoS coverage – particularly for engineering and computer science, and possibly also for nursing and health related disciplines – and we will investigate this further in discussion with subject representative groups. Also, reliance on a single database could have potentially adverse effects on publication behaviour. Potential solutions to these limitations may include taking into account material published outside of the WoS-covered journals or supplementing WoS with other sources of data. Such solutions however have not been tested on the scale required for the REF. We have commissioned further work on how we might extend the scope beyond WoS data, and remain open to the possibility of varying solutions to meet the particular needs of discipline groups. We will also keep under review our choice of source data, particularly in the light of increasing competition from alternative providers of citation data.

38. While WoS data are generally of good quality, we have not yet established that they are sufficiently free from error or uncertainty to be used at the level of disaggregation that we require in order to produce robust indicators, without further cleaning and verification. Expert advice is that HEIs will need to verify data about staff and outputs (and this is in line with our established

³ Lists of the journals included in the WoS and details of the journal selection process are available on the web at www.scientific.thomson.com/mjl

practice to always invite institutions to validate data that will be used in funding). We will need to develop and test a new process for institutions to validate the data, which will ultimately rely on institutions maintaining information about the publications of their staff. We plan to investigate options for streamlining this process including through the application of new technology.

Citation analysis

39. Citation data can be used to produce a variety of indicators. Having considered a number of options, we conclude that the best indicator of research quality at the level of disaggregation that we require will be based on citation rates per paper, aggregated for each subject group at each institution. This approach can be both robust and sensitive to differences between disciplines and sub-disciplines. Citation patterns vary greatly both between and within disciplines, hence citation rates per paper should be normalised by 'field' to account for this. They will also need to be normalised by type and by year of publication.

40. We propose that self-citations, while expected as normal practice, should be excluded for the purposes of the REF. We have expert advice that the scope for influencing citation impact through reciprocal citation – sometimes called 'citation clubs' – is not significant within our preferred approach.

41. The WoS database has an established system of classifying journals into 'fields' (sets of journals covering related topics). The disciplines that we propose to identify as science-based are made up of around 170 fields within the database.⁴ These fields are significantly narrower and more focused than the RAE units of assessment. We propose to use them as the basis for normalising citation rates, although there may be a need for the WoS classification of journals to be reviewed by UK-based experts to ensure it is suitable for our purposes. We will also need to devise a means of handling multidisciplinary journals, to assign papers to appropriate fields: approaches to this have already been developed by practitioners.

42. We also propose to map the fields to the REF subject groups, and use this structure for the purposes of associating staff with these groups and for aggregating and publishing the indicators. However, many staff publish in journals across a range of fields, possibly straddling two or more subject groups, and there are a number of options for aggregating the data. The technical work that we have commissioned is exploring these issues and options, and we expect it to generate some proposals to be tested in a pilot exercise in 2008.

43. Once the citation data for all eligible staff and outputs has been verified, processing this data to produce the quality indicator will be done mechanically using an algorithm to be specified following further technical development and consultation. We would prefer to use the same algorithm for all science-based disciplines, but variation between the discipline groups, or the use of supplementary data for some groups, is not ruled out at this stage.

Presenting the outcomes

44. We have considered a number of options for constructing indicators based on citation rates at the level of subject groups at individual HEIs. We propose to produce a single quality

⁴ Descriptions of the WoS fields and the journals assigned to them are available on the web at www.scientific.thomson.com/mjl

profile for each subject group at each institution. The quality profile would show the proportion of publications with citation rates in each of several banded categories of excellence, defined by reference to observed levels of citation internationally in a subject field. We are advised that, while the average **number** of citations per paper varies widely between disciplines, it will be reasonable to measure **relative levels of excellence** on a common basis once normalisation by field has been performed: thus for example it is reasonable to assume that material receiving citations at three times the field average rate is of a broadly equivalent level of international excellence across all disciplines. The table at Annex C gives citation profiles on this basis for all UK research in science-based disciplines: it shows that the distribution of work between relative levels of citation related to international norms does not vary so greatly between the disciplines as to rule out this approach.

45. The main alternative to a quality profile that we have considered is the production of a single point average citation rate for each subject group in an institution. That approach has been used elsewhere (notably in assessing relative levels of excellence comparing all UK research with other countries) but in the context of the new framework we prefer the profile because:

a. As with the RAE, it gives a finer but still robust degree of discrimination between departments that may have a similar average performance but a different internal distribution of excellence. Given that citation rates per paper are very unevenly distributed, a single point average score would conceal how much work at different levels there is within a subject group. This can be done with a profile, which enables us to identify more clearly where significant bodies of work of the very highest quality exist.

b. We have introduced quality profiles for the first time in the 2008 RAE and it will be preferable to retain this approach in moving to the new framework after that. This applies also to the disciplines that will be subject to light touch peer review in future; the use of a profile for the bibliometrics quality indicator enables quality outcomes to be presented in a common form across all disciplines.

46. As with the profiles in the 2008 RAE, it is unlikely to be the case that the work of a single individual will all fall within one quality category; thus the profile will show the distribution of activity and outputs by relative excellence for a subject group, not of individual staff.

47. We are commissioning further technical work to help us to consider where the boundaries between the quality levels might best be set, bearing in mind the purposes to which the profiles will be put. In particular, we envisage setting a threshold level below which outputs with comparatively few citations will be in the same category with work that has not been cited at all. This is broadly analogous to the employment of an 'unclassified' category within the quality profile in the 2008 RAE and we recognise that it will raise similar – and equally significant – questions about the likely response of HEIs in deciding which staff to put forward for inclusion in the assessment process. We are still considering this issue, and will keep under review our current intention to stay with the profile structure (four defined quality levels plus unclassified) adopted in RAE 2008.

48. In addition to the quality profile, the bibliometric exercise can produce a range of other statistics relating to publications and citations. The report by CWTS provides a number of examples of these. These statistics would help to set the quality profile in context, and may

provide valuable management information to HEIs, but would not be treated as direct measures of quality for funding purposes.

Potential concerns and solutions

49. Some concerns have emerged about the potential behavioural impact of a bibliometric-driven quality assessment system, in particular arising from the perception that citations are susceptible to manipulation over time. We are advised that the scope for manipulation is limited in practice; excellent research is cited by dozens or even hundreds of different institutions internationally. Moreover we will in the first instance use only citation data that pre-dates the introduction of the new system. As the new system becomes established over time we will be able to monitor potential changes in citation behaviour against that baseline, and may wish for example to introduce some mechanism for the reporting of cases of ‘suspicious’ citation behaviour.

50. There may be other impacts, which we will undertake further work to assess. These include other behavioural impacts, accountability burden, equal opportunities, and sustainability. We note at this stage that the behavioural incentives are both unpredictable and dependent on the precise operational criteria and definitions, which have not yet been determined; but we believe the proposed use of bibliometric indicators is consistent with the overall policy aim of enhancing the quality and impact of the research base.

51. Some stakeholders have suggested that bibliometric approaches may disadvantage interdisciplinary research. We commissioned a study on this, which found no evidence that citation rates are systematically lower for interdisciplinary research.⁵ We will investigate further the possibility, which has already been raised, that interdisciplinary research of good quality may be appearing more often in journals not covered by the WoS than for work of equal quality clearly falling within a single established discipline.

52. Concern has been expressed that bibliometric approaches do not recognise a clear link between quality and user value, and do not capture the quality of applied research as well as they do for basic research. We take these concerns seriously and invite proposals about how best to address them, including proposals for additional quantitative indicators that could help capture user value or the quality of applied research within the overall assessment and funding framework. We return to this point in paragraphs 56-57 below.

Question 2a: Do you agree that bibliometric indicators produced on the basis that we propose can provide a robust quality indicator in the context of our framework?

Question 2b: Are there particular issues of significance needing to be resolved that we have not highlighted?

⁵ ‘Bibliometric analysis of interdisciplinary research’ (A report to HEFCE by Evidence Ltd, November 2007).

Light-touch peer review

53. For the arts, humanities, social sciences and mathematics and statistics we will develop a quality assessment regime involving a light touch form of peer review informed by quantitative indicators. This will be taken forward working with specialist advisory groups and in consultation with subject interest bodies. At this stage, we envisage that:

- a. We will build on the work of the AHRC/HEFCE expert group on research metrics for arts and humanities disciplines,⁶ and also review the 2008 RAE shortly after it concludes, to identify the main sources of burden on panels and HEIs within the current regime and how they can be reduced.
- b. Avenues we will explore include the development of less burdensome approaches to peer review based on outputs (for example, structured reduction in the amount of reading of outputs done); and the scope for making greater use of information that is already available – including in particular giving greater weight to quantitative indicators within a peer review process.
- c. While the bibliometric data currently available for these disciplines are generally not sufficiently mature to produce robust indicators, we should continue to explore the potential for bibliometric indicators to play a greater role in quality assessment in these subjects as and where they are judged to be sufficiently robust.

Question 3a: What are the key issues that we should consider in developing light touch peer review for the non science-based disciplines?

Question 3b: What are the main options for the form and conduct of this review?

Range and use of quantitative indicators

54. As indicated above, we envisage that the overall assessment and funding framework for all disciplines will be built around a combination of existing quantitative indicators (notably for research income and research student numbers) and indicators of quality. We have also indicated that we envisage retaining the link made in our current funding arrangements between research student numbers, and income from certain sources, and our grant. We will need to undertake further work to establish the precise form of the indicators of income and research students within the new framework and how these would be collected and used to inform assessment and funding.

55. We expect to be able to make greater use of data collected through HESA than at present, though we recognise that we need to consider how far that might lead to a change either in the precise data definitions employed or in how HEIs complete their returns. As noted in our discussion of subject groupings above, this might entail the splitting of one or more of the current

⁶ 'Use of research metrics in the arts and humanities', Report of the expert group set up jointly by the AHRC and HEFCE, October 2006.

HESA subject cost centres (most probably the very large cost centres for clinical medicine and for humanities).

User value, applied research and economic impact

56. Our aim to develop a framework using the same basic dataset across all disciplines should not be taken to rule out the use of additional data in relation to some or all of the subject groups where this can help to make the framework more responsive to the needs and activities of particular disciplines or types of research. While the indicators discussed above capture several key elements of research, stakeholders have raised a concern that they would not adequately recognise particular features of certain types of research activity such as applied research and work of immediate and direct relevance to the needs of research users.

57. We are open to suggestions about what kind of quantitative indicators based on available data could be developed to capture user value and the quality of applied research; or suggestions for specific indicators to capture any other essential elements. We should however stress that any proposal for additional indicators would be considered against the policy background set out above. Thus we would be most receptive to proposals for indicators that:

- help us to take into account user value or the quality of applied research, or other key aspects of research excellence, that may not be fully recognised by indicators based on bibliometrics, research income and research student data
- are applicable at the level of our broad subject groups
- can be expressed in quantitative terms
- use data that is already available or would be reasonably straightforward to collect in suitably robust form.

58. We would need to look carefully at how the data should be interpreted – for example income data taken at face value can mask wide disparities in cost between sub-disciplines and obscure the question whether the income was allocated through rigorous peer review. For science-based disciplines in particular the indicators would have to be in a form that could with confidence be incorporated in a formula-driven approach; and for other disciplines it will be helpful if there is consensus on what they show and how the panels should interpret them. If we concluded that there was a case for introducing some variation in what indicators are used and how these are interpreted, we would expect to take the advice of the proposed expert panels in particular cases.

Question 4: Is there additional quantitative information that we should use in the assessment and funding framework to capture user value or the quality of applied research, or other key aspects of research excellence? Please be specific in terms of what the information is, what essential element of research it casts light on, how it may be found or collected, and where and how it might be used within the framework.

Role of the expert panels

59. At a number of points above we have referred to the role of the proposed expert panels. To summarise:

- We envisage establishing six expert panels for the new subject groups in science-based disciplines and a number to be determined in other disciplines. Panel members would be eminent UK and international practising researchers and research users.
- The science-based panels would advise on the selection and use of data and indicators within the framework in their subject group – including advising on the relative weight to be given to different indicators in their subject group. The other panels would advise on developing, and would then lead the conduct of, a light touch peer review process also drawing upon appropriate metrics.
- The panels might also advise us on our *overall* approach to using the outcomes in allocating grant.

Question 5: Are our proposals for the role of expert panels workable within the framework? Are there other key issues on which we might take their advice?
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Further work

60. Following this consultation exercise we will undertake further work in a number of areas, taking into account responses to the consultation, before implementation. We anticipate that this work will include:

- a. Further development of the criteria and methodology for producing bibliometric indicators in the science-based disciplines, including a substantial pilot exercise.
- b. Consideration of whether and how far the framework needs to incorporate variation for particular discipline groups – notably for engineering, computer science and nursing and allied health subjects – and whether additional information should be collected for this. We see scope in principle for variation between disciplines both within the bibliometric analysis and in the use of indicators across the framework.
- c. Further work to develop an approach to light touch peer review that will meet our aims and sit well within the framework. This would be informed by an evaluation of the 2008 RAE to identify the main sources of burden, and how they could be reduced.
- d. Consideration of the role to be played by the proposed expert panels, especially in the light of b. above.
- e. Assessment of the potential impact of the REF, in terms of behavioural incentives, accountability burden, equal opportunities and sustainability.

61. We have already commissioned some work to explore technical options in applying bibliometrics, to prepare for the pilot exercise. We plan to pilot the bibliometric indicators across all the science-based disciplines with a sample of institutions, during 2008. The purpose of this exercise is:

- to test and refine our approach
- to establish whether it is technically robust
- to identify and deal with operational issues that may only emerge in practice
- to enable us to take a view (drawing on expert advice as necessary) on whether the outcomes of the approach that we propose will produce results that command the confidence of the sector.

62. To these ends we will compare the outcomes of the pilot exercise to the results produced by the RAE in 2001 and subsequently in 2008. However, it should be stressed that our aim here is to ensure we understand the reasons for any differences – we would not necessarily expect the outcomes to be identical.

63. Institutions wishing to express an interest in principle in participating in the pilot may do so by e-mail (see paragraph 5).

64. We will then consult further, during autumn 2008, prior to running a full bibliometric exercise across the science-based disciplines during 2009 to inform our funding gradually from 2010.

65. Key stages in the proposed timetable are outlined below.

November 2007 to February 2008	Consultation on key elements of the framework and on bibliometric indicators. In parallel, further work on developing bibliometric techniques.
March to August 2008	Substantial pilot of our proposed approach.
Autumn 2008	Further consultation and decisions on the framework and indicators to be used for the science-based disciplines.
Early 2009	Launch of full bibliometrics exercise for science-based disciplines.
November 2009	Output of bibliometrics exercise available for use in funding; decisions on new funding approach to be phased in from 2010.
From late 2009	Consult on light touch peer review to run in 2013.

66. We recognise that the timetable is tight. It requires us to cover substantial new ground in the application of bibliometric indicators to quality assessment and funding; and depends heavily on the timely availability of comparatively scarce external expert advice.

Sector impact

67. Based on our work so far, we believe that the REF will when fully implemented reduce the burden on the sector compared to the RAE, since it is likely to rely more on available data and will operate at a broader level: this will reduce the scale and effort involved in making submissions or other inputs to the assessment process, and greatly reduce the number and workload of expert panels. However, during the transition period there may initially be significant work for institutions which they would not have had to undertake if the assessment regime had not been changed, particularly in verifying data about their research publications. The scale of burden will depend partly on how far institutions already compile data about the publications of their staff, and the work involved in doing this more systematically in future. Once internal systems have been developed, there is considerable potential for reducing the load in this area. We have noted that we see scope for applying new technology within such systems.

68. As we move towards decisions on the shape and implementation of the new arrangements we shall conduct a full sector impact assessment including looking at the implications for equal opportunities and sustainable development. We will seek to ensure that the new arrangements fully reflect our commitment and duty to promote equality and diversity; in particular we envisage requiring HEIs selecting their staff to have in place a code of practice similar to those required to be in place for the 2008 RAE.

Question 6: Are there significant implications for the burden on the sector of implementing our new framework that we have not identified? What more can we do to minimise the burden as we introduce the new arrangements?

Question 7: Do you consider that the proposals in this document are likely to have any negative impact on equal opportunities? What issues will we need to pay particular attention to?

Consultation process

69. Institutions and other stakeholders are invited to respond to the consultation by completing Annex A and e-mailing it to refconsultation@hefce.ac.uk by **Thursday 14 February 2008**.

70. The consultation process includes a series of events for institutions during January 2008 and a range of consultation meetings with other key stakeholders. Details of the events can be found at www.hefce.ac.uk/refconsult.

71. During the consultation period, frequently asked questions will be posted on the web at www.hefce.ac.uk alongside this document under Publications.

Annex A – see separate download

Annex B

Proposed groupings for the science-based disciplines

1. We propose the following subject groups for science-based disciplines, presented alongside RAE 2008 units of assessment and HESA cost centres for illustrative purposes. The groups would be mapped to bibliometric data (the WoS subject ‘fields’ referred to in paragraph 41 of the main text).
2. The six groups map to Main Panels A to E and G in the 2008 RAE **except** Unit of Assessment 23, Computer Science and Informatics, which we propose to combine with the subjects covered by Panel G.
3. The six groups map to HESA cost centres **except** that HESA cost centre 1 (Clinical Medicine) has to be split two or three ways to avoid creating a very large single group; and cost centre 8 (Pharmacy and Pharmacology) may need to be split two ways.

Subject group	RAE 2008 units of assessment	HESA cost centres
Clinical Medicine	1 Cardiovascular Medicine 2 Cancer Studies 3 Infection and Immunology 4 Other Hospital Based Clinical Subjects 5 Other Laboratory Based Clinical Subjects	1 Clinical Medicine (part)
Health Sciences	6 Epidemiology and Public Health 7 Health Services Research 8 Primary Care and Other Community Based Clinical Subjects 9 Psychiatry, Neuroscience and Clinical Psychology	1 Clinical Medicine (part)
Subjects Allied to Health	10 Dentistry 11 Nursing and Midwifery 12 Allied Health Professions and Studies 13 Pharmacy	2 Clinical Dentistry 5 Nursing and Paramedical Studies 6 Health and Community Studies 8 Pharmacy and Pharmacology (part)

Biological Sciences	14 Biological Sciences 15 Pre-clinical and Human Biological Sciences 16 Agriculture, Veterinary and Food Sciences	1 Clinical Medicine (part) 3 Veterinary Science 4 Anatomy and Physiology 8 Pharmacy and Pharmacology (part) 10 Biosciences 13 Agriculture and Forestry
Physical Sciences	17 Earth Systems and Environmental Sciences 18 Chemistry 19 Physics	11 Chemistry 12 Physics 14 Earth, Marine and Environmental Sciences
Engineering and Computer Science	23 Computer Science and Informatics 24 Electrical and Electronic Engineering 25 General Engineering and Mineral & Mining Engineering 26 Chemical Engineering 27 Civil Engineering 28 Mechanical, Aeronautical and Manufacturing Engineering 29 Metallurgy and Materials	25 Information Technology, Systems Sciences and Computer Software Engineering 16 General Engineering 17 Chemical Engineering 18 Mineral, Metallurgy and Materials Engineering 19 Civil Engineering 20 Electrical, Electronic and Computer Engineering 21 Mechanical, Aero and Production Engineering

Annex C

Citation impact of UK research

1. This annex provides summary data about the citation impact of all UK research papers in science-based disciplines covered by the Web of Science, published during the period 1997-2006. The analysis was prepared by the Centre for Science and Technology Studies at Leiden University.
2. Citation rates are normalised for year and type of publication, and self citations have been excluded. For further details of the methodology and the field groupings, see the report 'Scoping study on the use of bibliometric analysis to measure the quality of research in UK higher education institutions' (HEFCE, 2007, available on the HEFCE web-site under Publications/Research & evaluation). Note that for the purposes of this table, 'Multidisciplinary journals' are shown as a distinct field; we envisage that in the REF papers in these journals will be re-assigned to appropriate fields.
3. The final six columns in the table show a profile of UK research, in terms of the percentage of papers falling into each of several categories of field normalised citation impact (c/cf). The thresholds used in these categories are purely for illustrative purposes. No decisions have yet been taken about the thresholds to be used in the REF.

Bibliometric statistics for UK research in science-based disciplines, 1997-2006

	Total number of papers	Average number of citations per paper (c)	Citations per paper (c) / world-wide citations per paper in relevant fields (cf)	% of papers not cited	0.0 < c/cf ≤ 0.4 (% of papers)	0.4 < c/cf ≤ 0.8 (% of papers)	0.8 < c/cf ≤ 1.2 (% of papers)	1.2 < c/cf ≤ 2.0 (% of papers)	2.0 < c/cf ≤ 3.0 (% of papers)	c/cf > 3.0 (% of papers)
Agriculture and Food Science	19,785	7.0	1.2	25	16	17	11	14	8	11
Astronomy and Astrophysics	18,397	11.8	1.3	22	22	16	10	13	7	10
Basic Life Sciences	92,902	16.3	1.2	16	23	19	12	14	7	9
Basic Medical Sciences	9,332	7.1	1.0	25	20	19	11	11	6	8
Biological Sciences	43,899	9.3	1.3	22	16	17	12	14	8	11

Biomedical Sciences	90,857	12.2	1.2	19	21	18	12	13	7	10
Chemistry and Chemical Engineering	73,180	8.0	1.3	25	18	16	11	12	7	11
Civil Engineering and Construction	5,518	2.3	0.9	48	10	12	8	9	5	7
Clinical Medicine	239,258	9.2	1.2	29	18	15	10	11	7	9
Computer Sciences	25,664	3.1	1.2	51	10	10	6	8	5	10
Earth Sciences and Technology	32,874	6.8	1.2	27	15	15	12	13	8	10
Electrical Engineering and Telecommunication	22,344	2.9	1.0	48	12	13	7	8	5	7
Energy Science and Technology	10,179	3.0	0.9	44	13	13	8	9	5	8
Environmental Sciences and Technology	33,782	6.8	1.1	27	17	15	11	13	7	9
General and Industrial Engineering	8,371	2.6	1.0	43	10	14	9	10	7	8
Health Sciences	22,563	4.7	0.9	32	17	16	10	12	6	7
Instruments and Instrumentation	7,033	3.3	0.9	42	14	14	9	9	5	6
Mechanical Engineering and Aerospace	18,581	3.1	1.0	43	11	13	9	10	6	8
Multidisciplinary journals	10,586	36.5	1.4	28	24	12	7	10	6	12
Physics and Materials Science	95,790	6.3	1.2	33	17	14	9	11	6	10